Hypertherm®

# Powermax30® XP

## Plasma Arc Cutting System

## Service Manual

808150 | Revision 0 | English

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**For your records**

Serial number:_____

Purchase date: _____

Distributor: _____

_____

_____

Maintenance notes:

_____

_____

_____

_____

_____

_____

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# *Powermax30 XP*

## Service Manual

808150
Revision 0

English

February 2014

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# Safety information

Before operating any Hypertherm equipment, read the separate *Safety and Compliance Manual* (80669C) included with your product for important safety information.

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## Introduction

Hypertherm's CE-marked equipment is built in compliance with standard EN60974-10. The equipment should be installed and used in accordance with the information below to achieve electromagnetic compatibility.

The limits required by EN60974-10 may not be adequate to completely eliminate interference when the affected equipment is in close proximity or has a high degree of sensitivity. In such cases it may be necessary to use other measures to further reduce interference.

This cutting equipment is designed for use only in an industrial environment.

## Installation and use

The user is responsible for installing and using the plasma equipment according to the manufacturer's instructions.

If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the cutting circuit, see *Earthing of the work piece*. In other cases, it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases, electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

## Assessment of area

Before installing the equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- **a.** Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the cutting equipment.
- **b.** Radio and television transmitters and receivers.
- **c.** Computer and other control equipment.
- **d.** Safety critical equipment, for example guarding of industrial equipment.
- **e.** Health of the people around, for example the use of pacemakers and hearing aids.
- **f.** Equipment used for calibration or measurement.
- **g.** Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures.
- **h.** Time of day that cutting or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

## Methods of reducing emissions

### Mains supply

Cutting equipment must be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply.

Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and the cutting power source enclosure.

## Maintenance of cutting equipment

The cutting equipment must be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the cutting equipment is in operation. The cutting equipment should not be modified in any way, except as set forth in and in accordance with the manufacturer's written instructions. For example, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

## Cutting cables

The cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

### Equipotential bonding

Bonding of all metallic components in the cutting installation and adjacent to it should be considered.

However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode (nozzle for laser heads) at the same time.

The operator should be insulated from all such bonded metallic components.

### Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, for example, ship's hull or building steel work, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note: The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will in crease the risk of injury, for example, by allowing parallel cutting current return paths which may damage the earth circuits of other equipment. Further guidance is provided in IEC 60974-9, Arc Welding Equipment, Part 9: Installation and Use.

## Screening and shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.

## Attention

Genuine Hypertherm parts are the factory-recommended replacement parts for your Hypertherm system. Any damage or injury caused by the use of other than genuine Hypertherm parts may not be covered by the Hypertherm warranty, and will constitute misuse of the Hypertherm Product.

You are solely responsible for the safe use of the Product. Hypertherm does not and cannot make any guarantee or warranty regarding the safe use of the product in your environment.

## General

Hypertherm, Inc. warrants that its Products shall be free from defects in materials and workmanship for the specific periods of time set forth herein and as follows: if Hypertherm is notified of a defect (i) with respect to the plasma power supply within a period of two (2) years from the date of its delivery to you, with the exception of Powermax brand power supplies, which shall be within a period of three (3) years from the date of delivery to you, and (ii) with respect to the torch and leads within a period of one (1) year from its date of delivery to you, and with respect to torch lifter assemblies within a period of one (1) year from its date of delivery to you, and with respect to Automation products one (1) year from its date of delivery to you, with the exception of the EDGE Pro CNC, EDGE Pro Ti CNC, MicroEDGE Pro CNC, and ArcGlide THC, which shall be within a period of two (2) years from the date of delivery to you, and (iii) with respect to HyIntensity fiber laser components within a period of two (2) years from the date of its delivery to you, with the exception of laser heads and beam delivery cables, which shall be within a period of one (1) year from its date of delivery to you.

This warranty shall not apply to any Powermax brand power supplies that have been used with phase converters. In addition, Hypertherm does not warranty systems that have been damaged as a result of poor power quality, whether from phase converters or incoming line power. This warranty shall not apply to any product which has been incorrectly installed, modified, or otherwise damaged.

Hypertherm provides repair, replacement or adjustment of the Product as the sole and exclusive remedy, if and only if the warranty set forth herein properly is invoked and applies. Hypertherm, at its sole option, shall repair, replace, or adjust, free of charge, any defective Products covered by this warranty which shall be returned with Hypertherm's prior authorization (which shall not be unreasonably withheld), properly packed, to Hypertherm's place of business in Hanover, New Hampshire, or to an authorized Hypertherm repair facility, all costs, insurance and freight pre paid by the customer. Hypertherm shall not be liable for any repairs, replacement, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph and with Hypertherm's prior written consent.

The warranty set forth above is exclusive and is in lieu of all other warranties, express, implied, statutory, or otherwise with respect to the Products or as to the results which may be obtained therefrom, and all implied warranties or conditions of quality or of merchantability or fitness for a particular purpose or against infringement. The foregoing shall constitute the sole and exclusive remedy for any breach by Hypertherm of its warranty.

Distributors/OEMs may offer different or additional warranties, but Distributors/OEMs are not authorized to give any additional warranty protection to you or make any representation to you purporting to be binding upon Hypertherm.

## Patent indemnity

Except only in cases of products not manufactured by Hypertherm or manufactured by a person other than Hypertherm not in strict conformity with Hypertherm's specifications and in cases of designs, processes, formulae, or combinations not developed or purported to be developed by Hypertherm, Hypertherm will have the right to defend or settle, at its own expense, any suit or proceeding brought against you alleging that the use of the Hypertherm product, alone and not in combination with any other product not supplied by Hypertherm, infringes any patent of any third party. You shall notify Hypertherm promptly upon learning of any action or threatened action in connection with any such alleged infringement (and in any event no longer than fourteen (14) days after learning of any action or threat of action), and Hypertherm's obligation to defend shall be conditioned upon Hypertherm's sole control of, and the indemnified party's cooperation and assistance in, the defense of the claim.

## Limitation of liability

**In no event shall Hypertherm be liable to any person or entity for any incidental, consequential direct, indirect, punitive or exemplary damages (including but not limited to lost profits) regardless of whether such liability is based on breach of contract, tort, strict liability, breach of warranty, failure of essential purpose, or otherwise, and even if advised of the possibility of such damages.**

## National and local codes

National and local codes governing plumbing and electrical installation shall take precedence over any instructions contained in this manual. In no event shall Hypertherm be liable for injury to persons or property damage by reason of any code violation or poor work practices.

## Liability cap

**In no event shall Hypertherm's liability, if any, whether such liability is based on breach of contract, tort, strict liability, breach of warranties, failure of essential purpose or otherwise, for any claim, action, suit or proceeding (whether in court, arbitration, regulatory proceeding or otherwise) arising out of or relating to the use of the Products exceed in the aggregate the amount paid for the Products that gave rise to such claim.**

## Insurance

At all times you will have and maintain insurance in such quantities and types, and with coverage sufficient and appropriate to defend and to hold Hypertherm harmless in the event of any cause of action arising from the use of the products.

## Transfer of rights

You may transfer any remaining rights you may have hereunder only in connection with the sale of all or substantially all of your assets or capital stock to a successor in interest who agrees to be bound by all of the terms and conditions of this Warranty. Within thirty (30) days before any such transfer occurs, you agree to notify in writing Hypertherm, which reserves the right of approval. Should you fail timely to notify Hypertherm and seek its approval as set forth herein, the Warranty set forth herein shall be null and void and you will have no further recourse against Hypertherm under the Warranty or otherwise.

# Section 1
# Specifications

## Safety information

Before operating any Hypertherm equipment, read the separate *Safety and Compliance Manual* (80669C) included with your product for important safety information.

## System description

The Powermax30 XP is a highly portable, 30 A, handheld plasma cutting system appropriate for a wide range of applications. It uses air or nitrogen to cut electrically conductive metals, such as mild steel, stainless steel, or aluminum. With it you can cut thicknesses up to 15 mm (5/8 inches) and pierce thicknesses up to 6 mm (1/4 inch).

The Powermax30 XP ships in several different configurations, based on region. Typically all configurations include:

- 1 complete set of general-purpose consumables (preinstalled on the Duramax™ LT hand torch) for standard cutting:
  - 1 electrode
  - 1 swirl ring
  - 1 nozzle
  - 1 retaining cap
  - 1 shield
- 1 extra general-purpose nozzle
- 1 extra electrode
- FineCut® consumables for detailed cutting:
  - 1 FineCut nozzle
  - 1 FineCut deflector
- 1 region-specific air fitting:
  - Industrial interchange quick-disconnect nipple with 1/4 NPT threads (CSA models)
  - British Pipe Thread adapter G-1/4 BSPP with 1/4 NPT threads (CE and CCC models)

- Carrying strap
- Operator Manual
- Safety and Compliance Manual
- Quick Setup Card

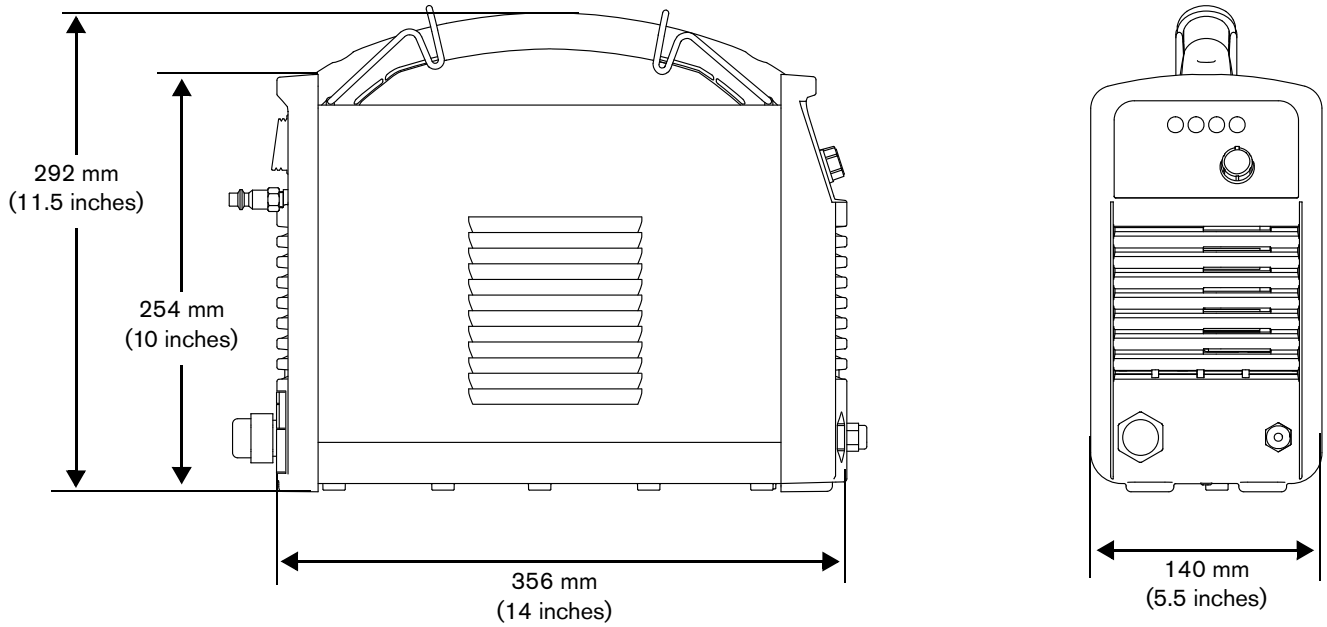
For details on how to select the right set of consumables for a given cutting job, see *Choose the consumables* on page 32.

Additional items may also ship with your Powermax30 XP depending on the configuration that you ordered, such as instructional setup materials, a carrying case, leather cutting gloves, or protective glasses.

CSA units ship with a 120 V/15 A (NEMA 5-15P) adapter and a 240 V/20 A (NEMA 6-50P) adapter that connect to the NEMA twist lock-style 240 V/20 A (NEMA L6-20P) plug wired to the power supply. CE and CCC units ship without a plug on the power cord. See *Power cord considerations* on page 26 for more information.

You can order additional consumables and accessories – such as the carrying case, carrying strap, and a circle cutting guide – from any Hypertherm distributor. See the *Parts* section on page 185 for a list of spare and optional parts.

## Power supply dimensions




## System weights

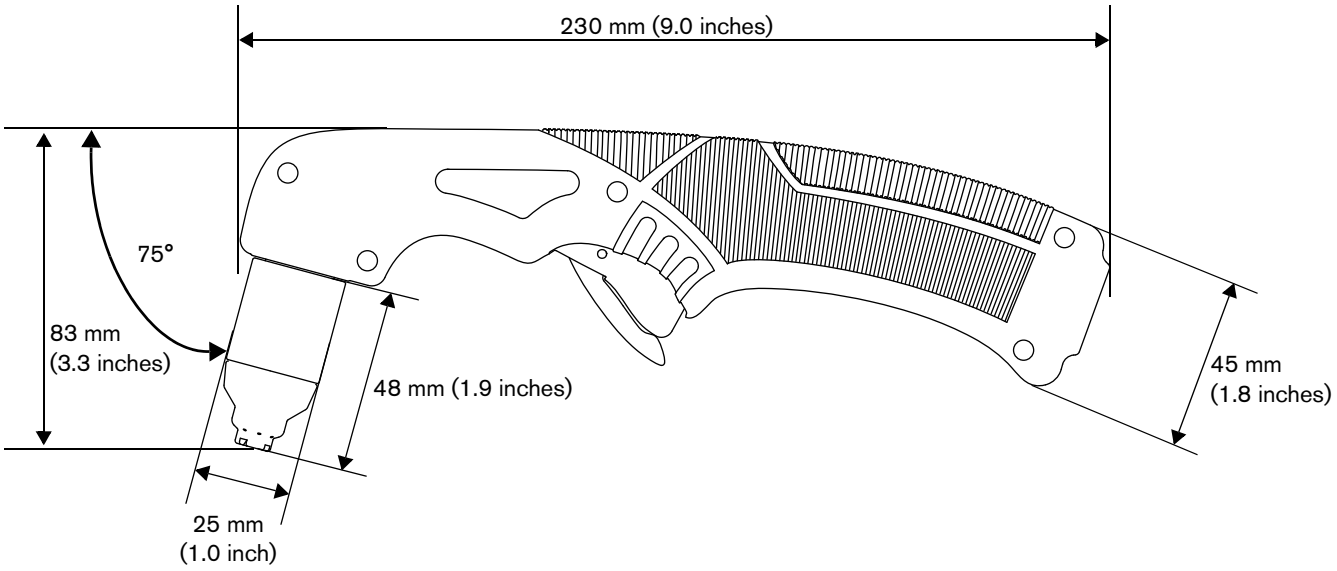
The following system weights include the hand torch with 4.6 m (15 foot) torch lead, a 4.6 m (15 foot) work lead with ground clamp, and a 3.0 m (10 foot) power cord:

- CSA systems: 9.7 kg (21.4 pounds)
- CE and CCC systems: 9.5 kg (21.0 pounds)

## Hypertherm system ratings

| | | |
|---|---|---|
| Rated open circuit voltage ($U_0$) | 256 VDC | |
| Rated output current ($I_2$) | 15 A to 30 A | |
| Rated output voltage ($U_2$) at $U_1$ = 120 VAC | 83 VDC | |
| Rated output voltage ($U_2$) at $U_1$ = 200 – 240 VAC | 125 VDC | |
| Duty cycle at 40°C, $U_1$ = 120 VAC<br>(See data plate on power supply for more information on duty cycle and for IEC ratings.) | 20% (I2 = 30 A, U2 = 83 V)<br>60% (I2 = 17 A, U2 = 83 V)<br>100% (I2 = 15 A, U2 = 83 V) | |
| Duty cycle at 40°C, $U_1$ = 200 – 240 VAC<br>(See data plate on power supply for more information on duty cycle and for IEC ratings.) | 35% (I2 = 30 A, U2 = 125 V)<br>60% (I2 = 23 A, U2 = 125 V)<br>100% (I2 = 18 A, U2 = 125 V) | |
| Operating temperature | -10° to 40° C (14° to 104° F) | |
| Storage temperature | -25° to 55° C (-13° to 131° F) | |
| Power factor (120 V – 240 V) | 0.99 – 0.97 | |
| Input voltage ($U_1$)/ Input current ($I_1$) at rated output ($U_{2\ MAX}$, $I_{2\ MAX}$)<br>(See *Voltage configurations* on page 25 for more information.) | 120 V / 25 A<br>200 – 240 V / 22.5 – 18.8 A | |
| Gas type | Air | Nitrogen |
| Gas quality | Clean, dry, oil-free | 99.995% pure |
| Minimum required gas inlet flow and pressure | 99.1 l/min at 4.7 bar (3.5 scfm at 68 psi) | |
| Recommended gas inlet flow and pressure | 113.3 l/min at 5.5 bar (4.0 scfm at 80 psi) | |
| Maximum gas inlet pressure | 9.3 bar (135 psi) | |

## Torch dimensions




## Torch weight

| | |
|---|---|
| Duramax LT torch with general-purpose consumables only | 0.3 kg (0.75 pounds) |
| Duramax LT torch with general-purpose consumables and 4.6 m (15 foot) lead (with strain relief) | 1.1 kg (2.35 pounds) |

## Cutting specifications

| **240 V (with general-purpose consumables)** | |
|---|---|
| Recommended cut capacity | 9 mm (3/8 inch) at 500 mm/minute (20 inches/minute)<br>12 mm (1/2 inch) at 250 mm/minute (10 inches/minute) |
| Severance cut capacity | 15 mm (5/8 inch) at 125 mm/minute (5 inches/minute) |

**120 V:** Use the FineCut nozzle and deflector for cutting on 120 V input circuits. When you operate the system at the maximum recommended output of 25 A, the cut capacities are:

- 6 mm (1/4 inch) at 480 mm/minute (19 inches/minute)
- 9 mm (3/8 inch) at 200 mm/minute (8 inches/minute)
- 12 mm (1/2 inch) at 75 mm/minute (3 inches/minute)

To understand the differences between the general-purpose and FineCut consumables, and for guidelines on selecting the right set for your cutting applications, see *Choose the consumables* on page 32.

## Symbols and marks

Your Hypertherm product may have one or more of the following markings on or near the data plate. Due to differences and conflicts in national regulations, not all marks are applied to every version of a product.

**S mark**

The S mark indicates that the power supply and torch are suitable for operations carried out in environments with increased hazard of electrical shock according to IEC 60974-1.

**CSA mark**

Hypertherm products with a CSA mark meet the United States and Canadian regulations for product safety. The products were evaluated, tested, and certified by CSA-International. Alternatively, the product may have a mark by one of the other Nationally Recognized Testing Laboratories (NRTL) accredited in both the United States and Canada, such as Underwriters Laboratories, Incorporated (UL) or TÜV.

**CE mark**

The CE marking signifies the manufacturer's declaration of conformity to applicable European directives and standards. Only those versions of Hypertherm products with a CE marking located on or near the data plate have been tested for compliance with the European Low Voltage Directive and the European Electromagnetic Compatibility (EMC) Directive. EMC filters needed to comply with the European EMC Directive are incorporated within versions of the product with a CE marking.

**Eurasian Customs Union (CU) mark**

CE versions of Hypertherm products that include an EAC mark of conformity meet the product safety and EMC requirements for export to Russia, Belarus, and Kazakhstan.

**GOST-TR mark**

CE versions of Hypertherm products that include a GOST-TR mark of conformity meet the product safety and EMC requirements for export to the Russian Federation.

**C-Tick mark**

CE versions of Hypertherm products with a C-Tick mark comply with the EMC regulations required for sale in Australia and New Zealand.

**CCC mark**

The China Compulsory Certification (CCC) mark indicates that the product has been tested and found compliant with product safety regulations required for sale in China.

**UkrSEPRO mark**

The CE versions of Hypertherm products that include a UkrSEPRO mark of conformity meet the product safety and EMC requirements for export to the Ukraine.

**Serbian AAA mark**

CE versions of Hypertherm products that include a AAA Serbian mark meet the product safety and EMC requirements for export to Serbia.

## Noise levels

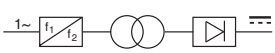
This plasma system may exceed acceptable noise levels as defined by national and local codes. Always wear proper ear protection when cutting. Any noise measurements taken depend on the specific environment in which the system is used. Refer to *Noise can damage hearing* in the *Safety and Compliance Manual* (80669C) included with your system.

In addition, you can find an *Acoustical Noise Data Sheet* for your system in the Hypertherm downloads library at https://www.hypertherm.com:

1. Click “Downloads library.”
2. Select a product from the “Product type” menu.
3. Select “Regulatory” from the “Category” menu.
4. Select “Acoustical Noise Data Sheets” from the “Sub Category” menu.

## IEC symbols

The following symbols may appear on the power supply data plate, control labels, switches, and LEDs.

| | | | |
|---|---|---|---|
| | Direct current (DC) |  | An inverter-based power source |
| | Alternating current (AC) | | Volt/amp curve, “drooping” characteristic |
| | Plasma torch cutting | | Power is ON (LED) |
| | AC input power connection | | Inlet gas pressure fault (LED) |
| | The terminal for the external protective (earth) conductor | | Missing or loose consumables (LED) |
| I | Power is ON | | Power supply is overheated (LED) |
| O | Power is OFF | | |

# Section 2

# Power Supply Setup

## Unpack the Powermax system

1. Verify that you received all items on your order in good condition. Contact your distributor if any parts are damaged or missing. (See *System contents* on page 24.)

2. Inspect the system for damage that may have occurred during shipment. If you find evidence of damage, refer to *Claims*. All communications regarding this equipment must include the model number and the serial number located on the bottom of the power supply.

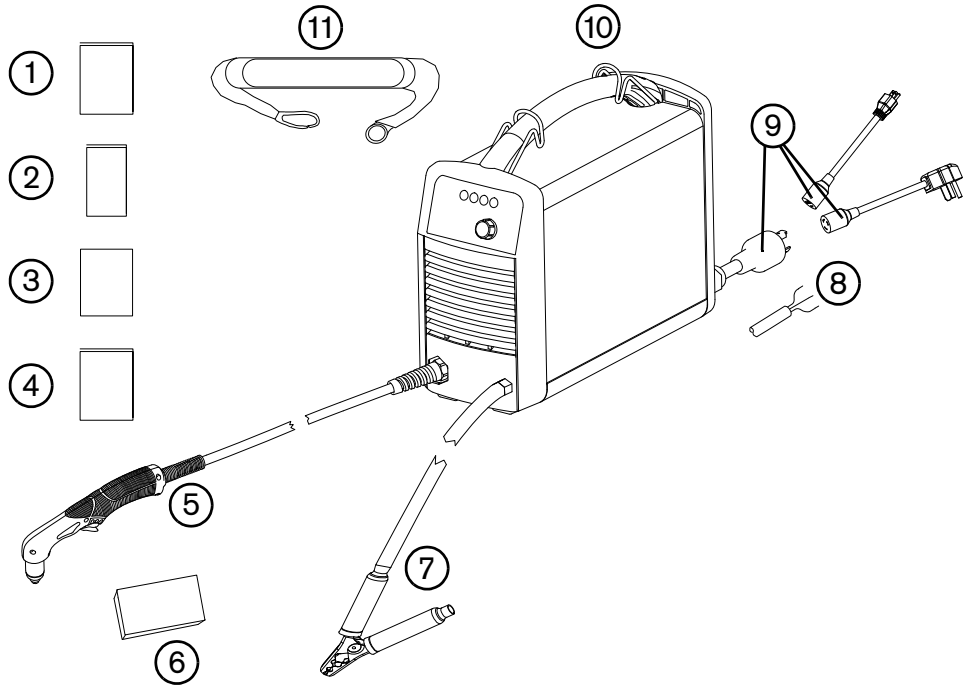
3. Before you set up and operate this Hypertherm system, read the separate *Safety and Compliance Manual* (80669C) included with your system for important safety information.

### Claims

- **Claims for damage during shipment** – If your unit was damaged during shipment, file a claim with the carrier. You can contact Hypertherm for a copy of the bill of lading. If you need additional assistance, call the nearest Hypertherm office listed in the front of this manual.
- **Claims for defective or missing merchandise** – If any component is missing or defective, contact your Hypertherm distributor. If you need additional assistance, call the nearest Hypertherm office listed in the front of this manual.

## System contents

The following illustration shows the components typically included with all system configurations. Additional components – such as setup instructions, a carrying case and protective glasses and gloves – may also be included with your system, depending on the configuration you ordered.




1. Operator Manual
2. Quick Setup Card
3. Registration card
4. Safety and Compliance Manual
5. Duramax LT torch with lead
6. Consumable kit
7. Ground clamp and work lead
8. CE/CCC power cord (no power plug included)
9. CSA power cord with power plug adaptors
10. Power supply
11. Carrying strap

The specific components included with the system are subject to change over time.

## Position the plasma cutting system

- Position the Powermax30 XP near an appropriate power receptacle. The system has a 3.0 m (10 foot) power cord.
- Allow at least 0.25 m (10 inches) of space around the power supply for proper ventilation.
- Place the power supply on a stable, level surface before using.
- Do not use the system in rain or snow.

## Prepare the electrical power

The system's maximum output voltage varies based on the input voltage and the circuit's amperage.

Additional factors must be considered when you are operating the system at an input power of 120 V, as tripped circuit breakers can result under some conditions. For more information, see *System operation guidelines* on page 47 and *Troubleshooting guide* on page 63.

### Voltage configurations

The system automatically adjusts for proper operation at the current input voltage without requiring you to perform any switching or rewiring. However, you must set the amperage adjustment knob to an appropriate output current and verify that an appropriate set of consumables is properly installed in the torch. For more information, see *Adjust the gas pressure and output current* on page 44 and *Install the consumables* on page 42.

The following table shows the maximum rated output for typical combinations of input voltage and amperage. The output setting you need to use depends on the thickness of the metal and is limited by the input power to your system.

| Input voltage circuit[1] | Rated output | Input at rated output, 60 Hz (CSA) or 50 Hz (CE/CCC), single-phase | kVA | Recommended consumables[2] |
|---|---|---|---|---|
| 120 V, 15 A | 20 A, 83 V | 16.4 A | 2.0 | FineCut |
| 120 V, 20 A | 25 A, 83 V | 20.5 A | 2.5 | FineCut |
| 120 V, 30 A | 30 A, 83 V | 25 A | 3.0 | FineCut |
| 240 V, 20 A | 30 A, 125 V | 22.5 – 18.8 A | 4.5 | General-purpose or FineCut |

[1] Input voltages can be ±10% of the values in this table.

[2] See *Choose the consumables* on page 32 for an explanation of general-purpose and FineCut consumables.

**CAUTION!**

**A circuit capable of 20 A/120 V or 20 A/240 V is required for proper operation. Protect the circuit with appropriately sized slow-blow (time-delay) fuses or circuit breakers.**

### Requirements for grounding

Properly ground the system as follows to ensure personal safety, proper operation, and to reduce electromagnetic interference (EMI):

- The system must be grounded through the power cord according to national and local electrical codes.
- Single-phase service must be of the three-wire type with a green (CSA) or green/yellow (CE/CCC) wire for the protective earth ground and must comply with national and local requirements. **Do not use a two-wire service.**
- Refer to the *Safety and Compliance Manual* (80669C) for more information.

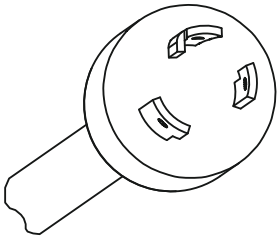
## Power cord considerations

This system ships with a CSA, CE, or CCC power cord configuration. See *Exterior, rear* on page 187 for part number information.

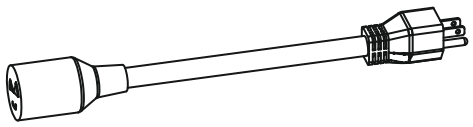
### CSA power cords and plugs

CSA configurations include the following plug and adapters.

- The power cord is equipped with a NEMA twist lock-style plug (NEMA L6-20P) appropriate for use on a 240 V/20 A circuit with a NEMA twist lock-style outlet.

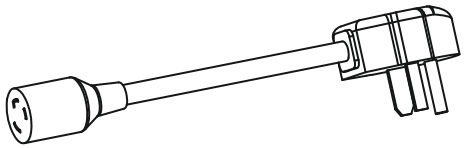


- To operate the system on a lower amperage circuit, attach the female end of the 120 V/15 A (NEMA 5-15P) plug adapter to the power supply's NEMA twist lock-style plug.



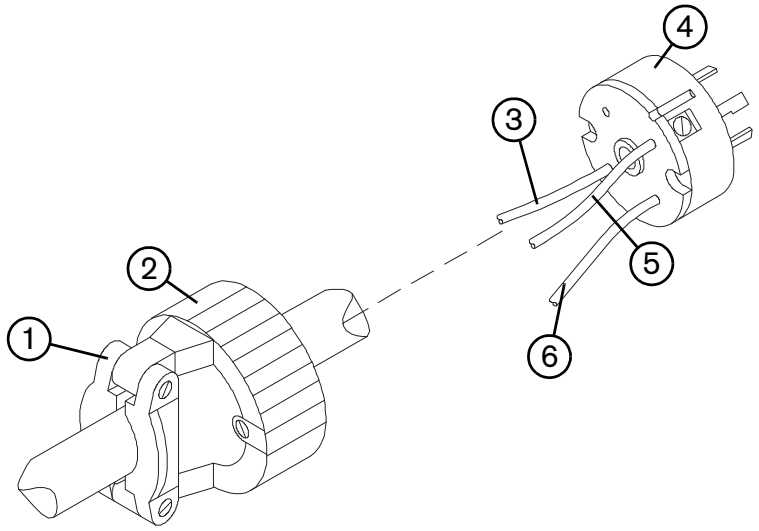
Do not set the amperage adjustment knob above 20 A, or you may trip the circuit breaker. See *Adjust the gas pressure and output current* on page 44.

- To operate the system on a 240 V/20 A circuit, attach the female end of the 240 V/20 A (NEMA 6-50P) plug to the power supply's NEMA twist lock-style plug.



## CE and CCC power cords

CE and CCC configurations ship without a plug on the power cord. To operate at 220 V (CCC) or 230 V (CE), obtain the correct plug for your unit and location and have it installed by a licensed electrician.




**1** Cord grip

**2** Outer shell

**3** To line 1 terminal (brown)

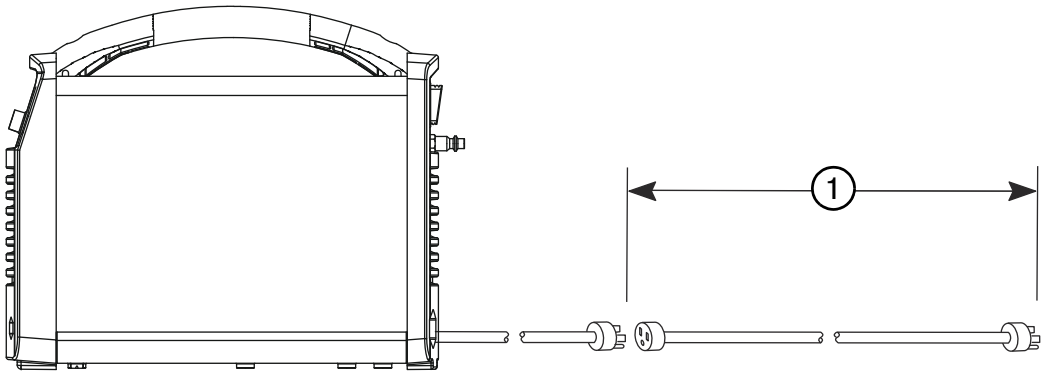
**4** 220 V (CCC) or 230 V (CE) plug

**5** To line 2 terminal (blue)

**6** To ground terminal (green/yellow)

1. Strip back the cord insulation to separate wires 3, 5, and 6.
2. Remove each wire's insulation to allow good contact with the plug terminals.
3. Make the connections.
4. Reinstall the outer shell and cord grip, and tighten the cord grip's screws until snug. Do not overtighten.

## Extension cord recommendations




Use an extension cord of an appropriate wire gauge for the cord length and system voltage. Use a cord that meets national and local codes.

| Input voltage | Phase | 1 | |
|---|---|---|---|
| | | Recommended cord gauge size | Length |
| 120 VAC | 1 | 4 mm² (12 AWG) | Up to 16 m (53 feet) |
| 240 VAC | 1 | 2 mm² (14 AWG) | Up to 40.5 m (133 feet) |

Extension cords can cause the machine to receive less input voltage than the output of the circuit. This can limit the operation of your system.

## Generator recommendations

Generators used with this system should produce 240 VAC.

| Engine drive rating | Engine drive output current 1-phase (CSA/CE/CCC) | Performance (arc stretch) |
|---|---|---|
| 5.5 kW | 30 A | Full |
| 4 kW | 25 A | Limited |

Adjust the cutting current as needed based on the generator rating, age, and condition.

If a fault occurs while using a generator, turn OFF the system and wait approximately 60 seconds before turning it ON again. Turning the power switch quickly to OFF and ON again (called a “quick reset”) may not clear the fault.

## Prepare the gas supply

The gas supply can be shop-compressed or cylinder-compressed. You must use a high-pressure regulator on either type of supply, and the regulator must deliver gas to the filter on the power supply at 99.1 l/min at 4.7 bar (3.5 scfm at 68 psi). To ensure adequate pressure to the power supply, set the regulator between 5.5 and 6.9 bar (80 and 100 psi).

The system contains an internal filter element, but additional filtration may be required depending on the quality of the gas supply. If gas supply quality is poor, cut speeds decrease, cut quality deteriorates, cutting thickness capability decreases, and the life of the consumables shortens. For optimal performance, the gas should have a maximum:

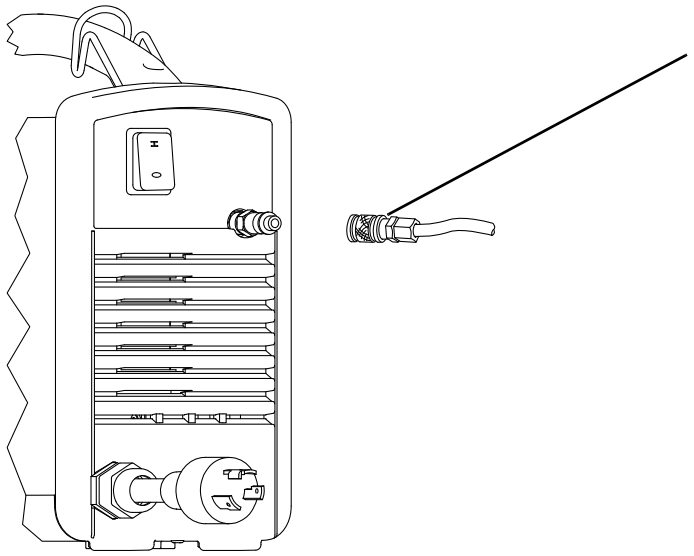
- Particle size of 0.1 micron at a maximum concentration of 0.1 mg/m$^3$
- Dew point of -40° C (-40° F)
- Oil concentration of 0.1 mg/m$^3$ (per ISO 8573-1 Class 1.2.2)

### Connect the gas supply

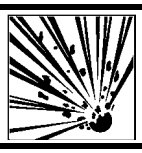
Connect the gas supply to the power supply using an inert gas hose with a 6.3 mm (1/4 inch) or greater internal diameter and an industrial interchange quick-disconnect coupler (for CSA models) or a G-1/4 BSPP threaded coupling (for CE and CCC models).

**CAUTION!**

**Some air compressors use synthetic lubricants containing esters that damage the polycarbonates used in the air filter bowl.**

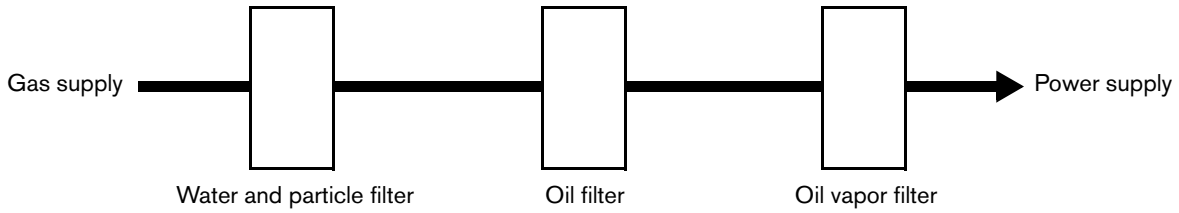


The recommended inlet pressure while gas is flowing is 5.5 – 6.9 bar (80 – 100 psi).

| | |
|---|---|
| | **WARNING!** |
|  | **The air filter bowl may explode if the gas supply pressure exceeds 9.3 bar (135 psi).** |

## Additional gas filtration

When site conditions introduce moisture, oil, or other contaminants into the gas line, use a three-stage coalescing filtration system, such as the Eliminizer filter kit (128647) available from Hypertherm distributors. A three-stage filtering system works as follows to clean contaminants from the gas supply.



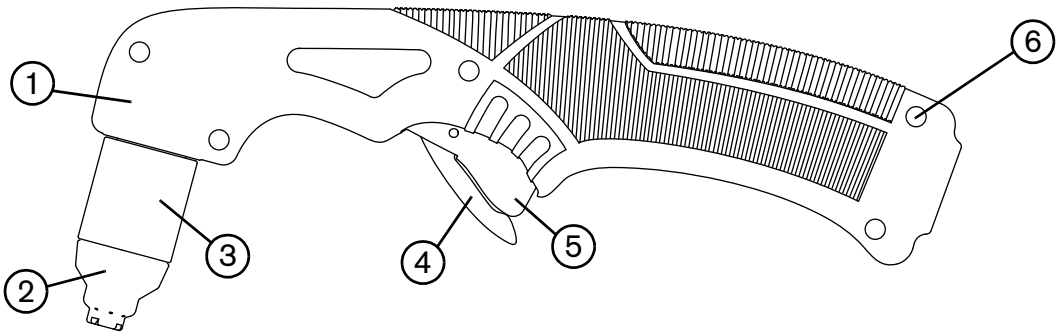

Install the filtering system between the quick-disconnect coupler and the power supply.

# Section 3
# Torch Setup

## Introduction

The Powermax30 XP includes the Duramax LT hand torch. This section explains how to set up and operate your torch. To achieve optimal consumable life and cut quality, follow the instructions in this manual.

### Hand torch components




**1** Handle
**2** Shield (shown) or deflector
**3** Retaining cap
**4** Safety catch
**5** Trigger (red)
**6** Screws (5)

## Consumable life

Consumable life varies based on the following factors:

- Thickness of the metal
- Length of the average cut
- Gas supply quality (presence of oil, moisture, or other contaminants)
- Type of cutting (piercing decreases life when compared to edge cutting)
- Pierce height
- Consumables (FineCut or general-purpose)

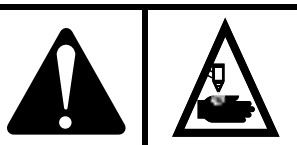
Hypertherm does not recommend the use of any other consumables in the Duramax LT torch except for those listed in this section, which are designed specifically for this system. The use of any other consumables could adversely affect system performance.

Although largely dependent on the factors listed above, as a general rule, the consumables last approximately 1 to 2 hours of actual “arc on” time.

If the consumables’ life is shorter than expected or the cut quality is poor, verify that you are using the correct combination of consumables. (See the following topic, *Choose the consumables*.) Under normal conditions, the nozzle wears out first.

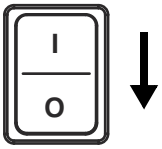
See *Hand torch operation* on page 48 for more information about proper cutting techniques.

## Choose the consumables



**WARNING!**

**INSTANT-ON TORCHES**
**PLASMA ARC CAN CAUSE INJURY AND BURNS**




**The plasma arc ignites immediately when you press the torch trigger. Make sure the power is OFF before changing consumables.**

The Duramax LT hand torch ships with general-purpose consumables installed. The general-purpose consumables are designed for a broad range of cutting applications.

Also included with your system is at least one FineCut nozzle and deflector. The FineCut consumables are designed to achieve more finely detailed results on thin gauge metal.

The retaining cap, swirl ring, and electrode are the same for both sets of consumables.

The consumables that you choose should be determined by the:

- Input power
- Amperage output setting
- Thickness of the metal you plan to cut

The amperage output setting you need to use depends on the thickness of the metal you are planning to cut and is limited by the input power to your system. See *Voltage configurations* on page 25.

**Although the visual differences between the general-purpose and FineCut consumable parts are minor, installing the wrong combination of consumables will affect the life of the parts as well as the cut quality.**

Hypertherm does not recommend the use of any other consumables in the Duramax LT torch except for those listed in this section, which are designed specifically for this system. The use of any other consumables could adversely affect system performance.

Figure 1 and Figure 2 illustrate the differences between the general-purpose and FineCut nozzles and between the deflector and the shield. The FineCut consumables have rings or grooves etched onto them (as shown in Figure 2) to help you distinguish them from the general-purpose consumables.

**Figure 1 – General-purpose**

General-purpose nozzle

Shield

**Figure 2 – FineCut**

FineCut nozzle

Deflector

## Using the cut charts

The following topics provide cut charts for each set of consumables. Use these cut charts to guide you in selecting the consumables and cutting current based on the thickness and type of the metal you need to cut.

The maximum cut speeds listed in the cut charts are the fastest possible speeds to cut metal without regard to cut quality. Recommended cut speeds are a starting point for finding the best quality cut (best angle, least dross, and best cut surface finish). Adjust the cutting speed for your application to obtain the desired cut quality.

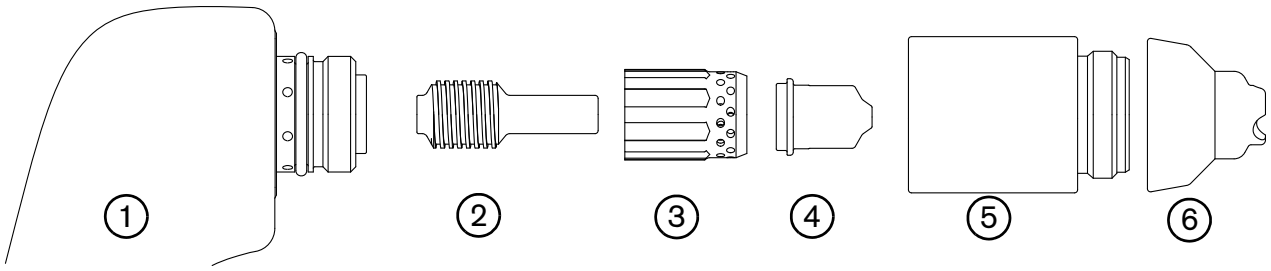
When cutting thin metal – 3 mm (10 gauge) or thinner – you may achieve a higher cut quality by using the FineCut consumables and cut charts.

## General-purpose consumables

Use the general-purpose consumables to cut thicker metals that do not require cuts that are as finely detailed. (See *Voltage configurations* on page 25 and *System operation guidelines* on page 47.) This set includes an electrode, swirl ring, general-purpose nozzle, retaining cap, and shield. The general-purpose nozzle must be installed only with the shield, not the deflector.

Cutting at 120 V with the general-purpose consumables is not recommended.

**Figure 3 – General-purpose consumable set**




**1** Torch
**2** Electrode (420120)
**3** Swirl ring (420211)
**4** Nozzle (420118)
**5** Retaining cap (420114)
**6** Shield (420116)

## 240 V / 30 A cutting

General-purpose consumables

**Metric**

| Material thickness (mm) | Material | Arc current (A) | Maximum cut speed (mm/minute) |
|---|---|---|---|
| 1 | Mild steel | 30 | 10160[2] |
| 2 | | | 7530 |
| 3 | | | 4185 |
| 5 | | | 1835 |
| 8[1] | | | 780 |
| 12[1] | | | 320 |
| 16[1] | | | 175 |
| 1 | Stainless steel | 30 | 8355 |
| 2 | | | 5635 |
| 3 | | | 2910 |
| 5 | | | 1245 |
| 8[1] | | | 575 |
| 10[1] | | | 360 |
| 13[1] | | | 215 |
| 3 | Aluminum | 30 | 3555 |
| 5 | | | 2115 |
| 8[1] | | | 785 |
| 10[1] | | | 425 |
| 13[1] | | | 205 |

**English**

| Material thickness (gauge/inches) | Material | Arc current (A) | Maximum cut speed (inches/minute) |
|---|---|---|---|
| 18 GA | Mild steel | 30 | 400[2] |
| 10 GA | | | 110 |
| 1/4 | | | 40 |
| 3/8[1] | | | 22 |
| 1/2[1] | | | 10 |
| 5/8[1] | | | 7 |
| 18 GA | Stainless steel | 30 | 306 |
| 10 GA | | | 70 |
| 1/4 | | | 31 |
| 3/8[1] | | | 15 |
| 1/2[1] | | | 9 |
| 1/8 | Aluminum | 30 | 135 |
| 1/4 | | | 45 |
| 3/8[1] | | | 18 |
| 1/2[1] | | | 9 |

[1] To cut material thicker than 6 mm (1/4 inch), start the torch at the edge of the workpiece.

[2] Maximum cut speed is limited by the test table's maximum speed (10160 mm/minute or 400 inches/minute).

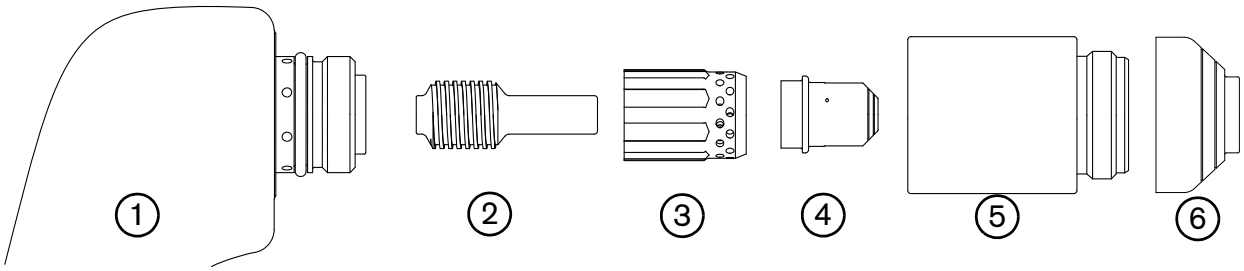
## FineCut consumables

Use the FineCut consumables for detailed cutting on thin gauge metal. The FineCut consumable set uses a FineCut nozzle and a deflector with the same electrode, swirl ring, and retaining cap used in the general-purpose consumable set.

The FineCut nozzle must be installed only with the deflector, not the shield. Using the shield results in poor cut quality and increased power demand because the torch-to-work distance is too great.

For guidelines on cutting with 120 V input, see *Recommendations for cutting at 120 V* on page 49.

**Figure 4 – FineCut consumable set**




**1** Torch
**2** Electrode (420120)
**3** Swirl ring (420211)
**4** Nozzle (420117)
**5** Retaining cap (420114)
**6** Deflector (420115)

# 120 V / 25 A cutting

FineCut consumables

**Metric**

| Material thickness (mm) | Material | Arc current (A) | Maximum cut speed (mm/minute) |
|---|---|---|---|
| 1 | Mild steel | 25 | 10160[2] |
| 2 | | | 3570 |
| 3 | | | 1745 |
| 5 | | | 905 |
| 6 | | | 590 |
| 7[1] | | | 280 |
| 1 | Stainless steel | 25 | 8390 |
| 2 | | | 2860 |
| 3 | | | 1500 |
| 5 | | | 825 |
| 6 | | | 515 |
| 7[1] | | | 205 |
| 1 | Aluminum | 25 | 10160[2] |
| 2 | | | 5130 |
| 3 | | | 2170 |
| 5 | | | 920 |
| 7[1] | | | 120 |

**English**

| Material thickness (gauge/inches) | Material | Arc current (A) | Maximum cut speed (inches/minute) |
|---|---|---|---|
| 18 GA | Mild steel | 25 | 330 |
| 16 GA | | | 205 |
| 14 GA | | | 150 |
| 12 GA | | | 80 |
| 10 GA | | | 55 |
| 1/4 | | | 19 |
| 18 GA | Stainless steel | 25 | 260 |
| 16 GA | | | 160 |
| 14 GA | | | 120 |
| 12 GA | | | 65 |
| 10 GA | | | 52 |
| 1/4 | | | 16 |
| 1/25 | Aluminum | 25 | 400[2] |
| 1/16 | | | 250 |
| 1/8 | | | 65 |
| 1/4 | | | 15 |

[1] To cut material thicker than 6 mm (1/4 inch), start the torch at the edge of the workpiece.

[2] Maximum cut speed is limited by the test table's maximum speed (10160 mm/minute or 400 inches/minute).

## 120 V / 30 A cutting

FineCut consumables

**Metric**

| Material thickness (mm) | Material | Arc current (A) | Maximum cut speed (mm/minute) |
|---|---|---|---|
| 1 | Mild steel | 30 | 10160[2] |
| 2 | | | 6175 |
| 3 | | | 2420 |
| 5 | | | 1300 |
| 8[1] | | | 535 |
| 10[1] | | | 280 |
| 13[1] | | | 110 |
| 1 | Stainless steel | 30 | 10025 |
| 2 | | | 5755 |
| 3 | | | 2045 |
| 5 | | | 1135 |
| 8[1] | | | 410 |
| 10[1] | | | 170 |
| 1 | Aluminum | 30 | 10160[2] |
| 2 | | | 6805 |
| 3 | | | 3285 |
| 5 | | | 1455 |
| 8[1] | | | 375 |
| 10[1] | | | 150 |

**English**

| Material thickness (gauge/inches) | Material | Arc current (A) | Maximum cut speed (inches/minute) |
|---|---|---|---|
| 22 GA | Mild steel | 30 | 400[2] |
| 18 GA | | | 400[2] |
| 12 GA | | | 112 |
| 10 GA | | | 75 |
| 1/4 | | | 31 |
| 3/8[1] | | | 12 |
| 1/2[1] | | | 5 |
| 22 GA | Stainless steel | 30 | 400[2] |
| 18 GA | | | 390 |
| 12 GA | | | 90 |
| 10 GA | | | 69 |
| 1/4 | | | 24 |
| 3/8[1] | | | 9 |
| 1/25 | Aluminum | 30 | 400[2] |
| 1/16 | | | 325 |
| 1/8 | | | 105 |
| 1/4 | | | 22 |
| 3/8[1] | | | 8 |

[1] To cut material thicker than 6 mm (1/4 inch), start the torch at the edge of the workpiece.

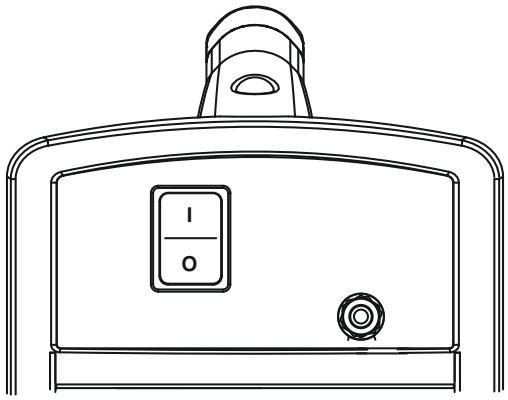
[2] Maximum cut speed is limited by the test table's maximum speed (10160 mm/minute or 400 inches/minute).

# Section 4
# Operation

## Controls and indicators

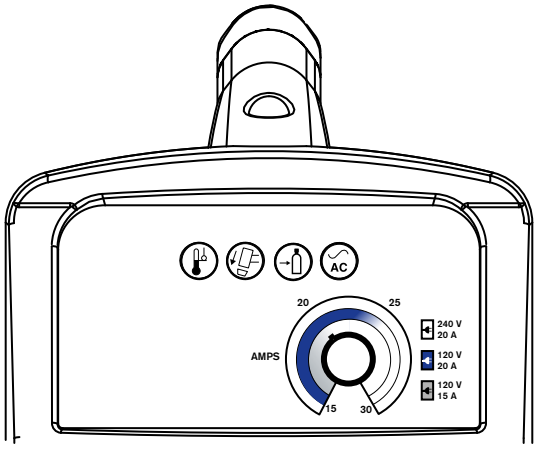
Refer to the following topics to become familiar with the controls and LED indicators on the system before you begin cutting.

### Rear controls



**ON (I) / OFF (O) power switch** – Activates the system and its control circuits.

## Front controls and LEDs



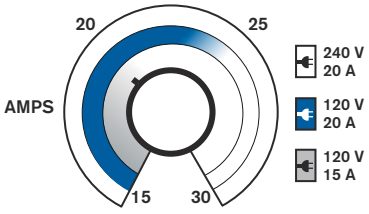

**Power ON LED (green)** – When illuminated, this LED indicates that the power switch has been set to ON (**I**) and that the safety interlocks are satisfied.

**Gas pressure LED (yellow)** – When illuminated, this LED indicates that the inlet gas pressure is below 2.8 bar (40 psi).

**Torch cap LED (yellow)** – When illuminated, this LED indicates that the consumables are loose, improperly installed, or missing.

**Temperature LED (yellow)** – When illuminated, this LED indicates that the system's temperature is outside the acceptable operating range.

Some fault conditions cause one or more of the LEDs to blink. For information on what these fault conditions are and how to clear them, see *Troubleshooting guide* on page 63.



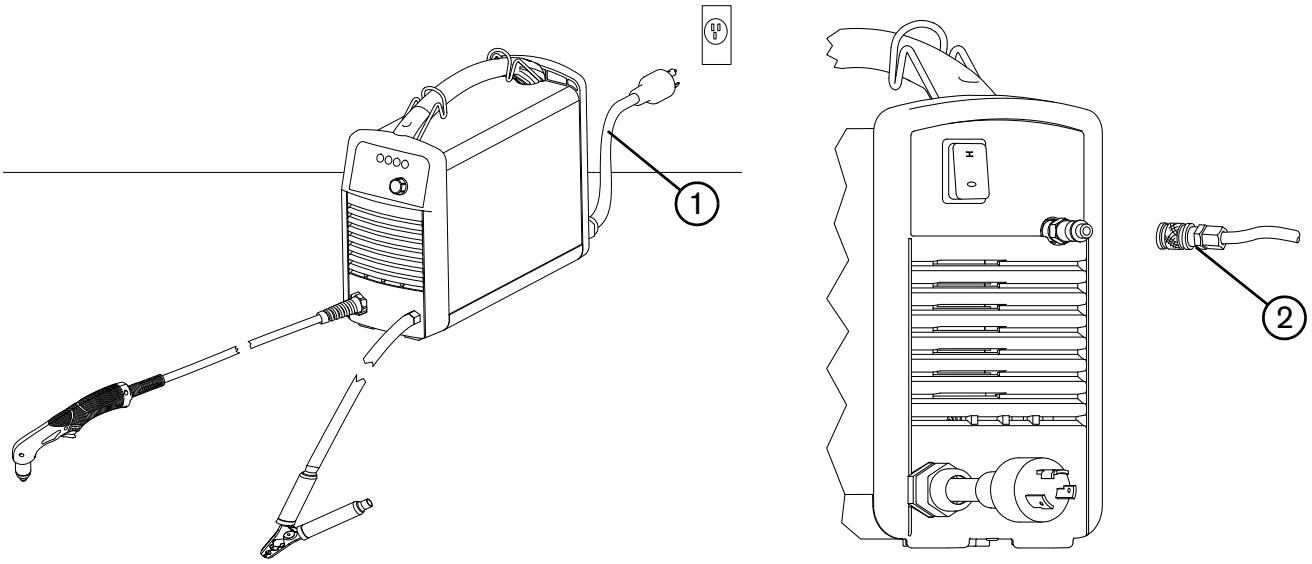

**Amperage adjustment knob** – Use this knob to set the output current between 15 A and 30 A.

# Operate the Powermax30 XP

The following topics explain how to begin cutting with the Powermax30 XP.

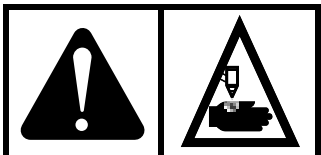
## Connect the electrical power and gas supply

Plug in the power cord ① and connect the gas supply line ②.



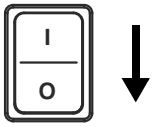

- For information on connecting the gas supply to the power supply, see *Prepare the gas supply* on page 29.
- For information on connecting the proper plug to the power cord, see *Power cord considerations* on page 26.
- To understand which consumables to use and what cutting capacity to expect based on input voltage, see *Choose the consumables* on page 32.
- For information on electrical requirements and gas supply requirements for this system, see *Power Supply Setup* on page 23.

## Install the consumables



**WARNING!**

**INSTANT-ON TORCHES**
**PLASMA ARC CAN CAUSE INJURY AND BURNS**



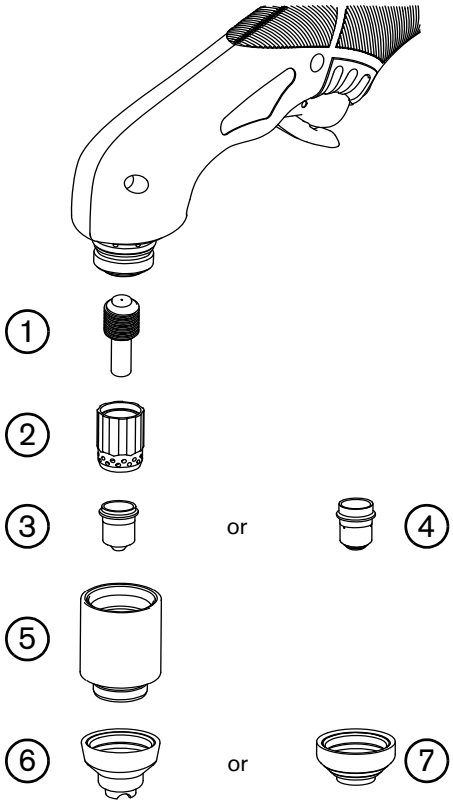

**The plasma arc ignites immediately when you press the torch trigger. Make sure the power is OFF before changing consumables.**

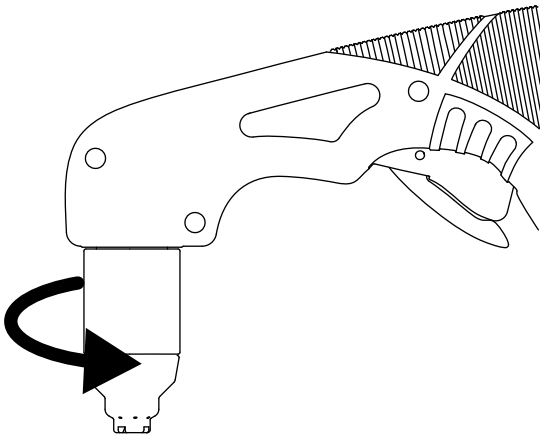
To operate the Duramax LT torch, first verify:

1. The power switch is in the OFF (**O**) position.
2. A complete set of consumables is installed as shown in Figure 5.
3. You use only the shield (420116) with the general-purpose nozzle (420118).

To understand the differences between the general-purpose and FineCut consumables, and for guidelines on selecting the right set for your cutting applications, see *Choose the consumables* on page 32.

**Figure 5**



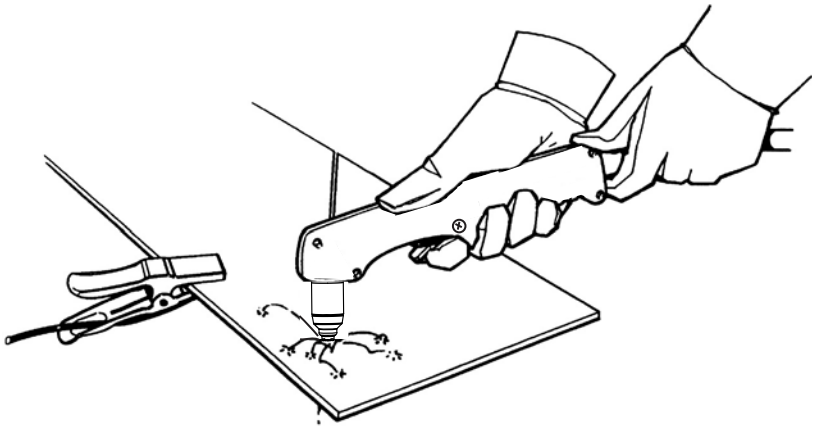
Tighten only to finger tight.

**1** Electrode
**2** Swirl ring
**3** Nozzle (general-purpose)
**4** Nozzle (FineCut)
**5** Retaining cap
**6** Shield (general-purpose)
**7** Deflector (FineCut)

## Attach the ground clamp

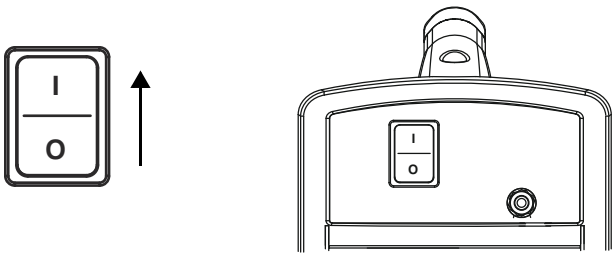
Attach the ground clamp to the workpiece.

- Verify that the ground clamp and the workpiece make good metal-to-metal contact.
- Attach the ground clamp as close as possible to the area being cut to reduce exposure to electric and magnetic fields (EMF) and to achieve the best possible cut quality.
- **Do not attach the ground clamp to the portion of the workpiece that you are cutting away**.



## Power ON the system

Set the ON/OFF switch to the ON (**I**) position.

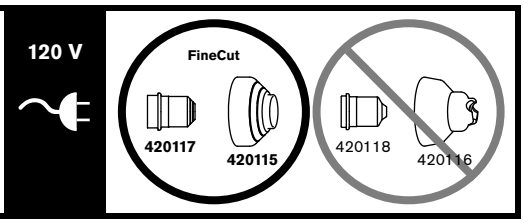



## Adjust the gas pressure and output current

The power ON LED and the gas pressure LED illuminate when there is insufficient gas pressure to the system. Use a high-pressure regulator that is capable of delivering gas to the filter on the power supply at 99.1 l/min at 4.7 bar (3.5 scfm at 68 psi). For more information on attaching the gas supply, see *Prepare the gas supply* on page 29.

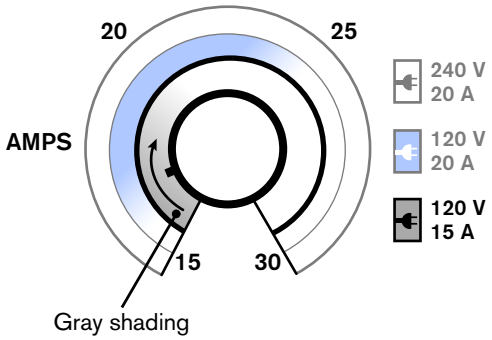
1. Set the regulator between 5.5 and 6.9 bar (80 and 100 psi).
2. Turn the amperage knob to the desired output current based on the input voltage, circuit size, and consumables.

**Use only the FineCut consumables when operating the system on a 120 V input circuit.**



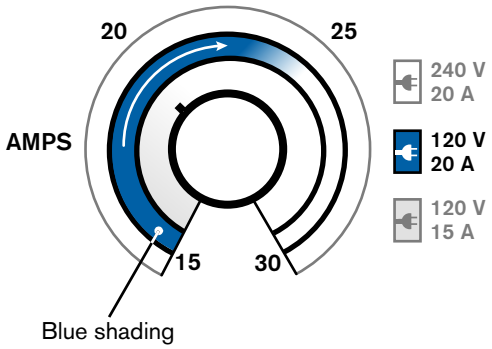

### Operating the system on a 120 V, 15 A circuit

- Set the amperage below 20 A, as indicated by the gray shading around the knob (the inner ring).
- Use only the FineCut nozzle (420117) and deflector (420115); do not use the general-purpose nozzle (420118) or shield (420116).
- Verify that nothing else is drawing power from the circuit.




### Operating the system on a 120 V, 20 A circuit

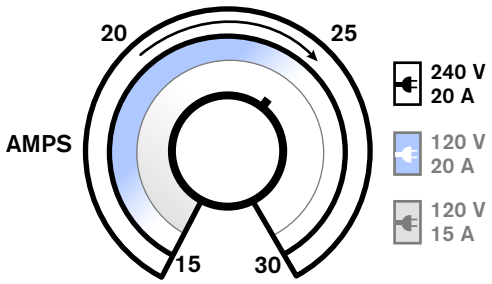
- Set the amperage below 25 A, as indicated by the blue shading around the knob (the middle ring).
- Use only the FineCut nozzle (420117) and deflector (420115); do not use the general-purpose nozzle (420118) or shield (420116).
- Verify that nothing else is drawing power from the circuit.




### Operating the system on a 240 V, 20 A circuit

- Set the amperage between 15 – 30 A.
- Use either the general-purpose or the FineCut consumables.

Do not mix the general-purpose and FineCut consumables. Use one set or the other.

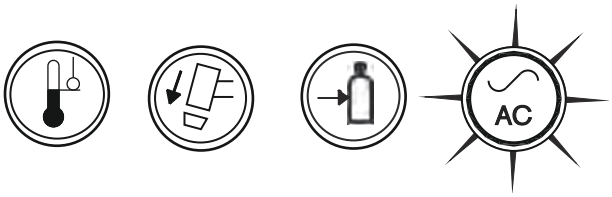



See *Voltage configurations* on page 25 for more information.

### Check the indicator LEDs

Verify that the green power ON LED on the front of the power supply is illuminated and that none of the other LEDs are illuminated or blinking.

If the temperature, torch cap sensor, or gas pressure LEDs illuminate or blink, or if the power ON LED blinks, correct the fault condition before continuing. See *Troubleshooting guide* on page 63 section for more information.




### Verify the system is ready

When the power ON LED illuminates, none of the other LEDs illuminate or blink, and the amperage knob is set, the system is ready for use.

## Understand duty-cycle limitations

The duty cycle is the percentage of time out of 10 minutes that a plasma arc can remain on when operating at an ambient temperature of 40° C (104° F).

With input power of 120 V:

- At 30 A, the arc can remain on for 2.0 minutes out of 10 minutes without causing the unit to overheat (20% duty cycle).
- At 17 A, the arc can remain on for 6 minutes out of 10 (60%).
- At 15 A, the arc can remain on for 10 minutes out of 10 (100%).

With input power of 240 V:

- At 30 A, the arc can remain on for 3.5 minutes out of 10 (35% duty cycle).
- At 23 A, the arc can remain on for 6 minutes out of 10 (60%).
- At 18 A, the arc can remain on for 10 minutes out of 10 (100%).

When the duty cycle is exceeded, the system overheats, the temperature LED illuminates, the arc shuts off, and the cooling fan continues to run. To resume cutting, wait for the temperature LED to extinguish.

The fan may run during normal operation of the system.

## System operation guidelines

- To achieve the highest level of performance:
  - Operate the system at an input power of 240 VAC whenever possible.
  - Avoid using an extension cord whenever possible.

    If you must use an extension cord, use a heavy conductor cord of the shortest possible length. See *Extension cord recommendations* on page 28.

- If you are operating your system on a 120 V, 15 A circuit, do not set the amperage higher than 20 A. See *Voltage configurations* on page 25.
- For best results when operating your system on a 120 V, 15 A circuit:
  - Do not connect anything else that will draw power from the same circuit.
  - Be aware that extension cords can reduce the voltage to the machine from what is output by the circuit. This reduction in power can impair cutting performance and increase the probability of tripping the circuit breaker.
- Cutting a thicker workpiece with the general-purpose consumables requires a higher amperage setting. It is preferable to operate on a higher rated circuit (240 V / 30 A) when cutting thicker metal. See *Voltage configurations* on page 25.
- Additional techniques to reduce the frequency of tripped circuit breakers include:
  - Turn down the amperage adjustment knob.
  - Avoid stretching the arc. Instead, drag the torch on the workpiece as explained in *Edge start on a workpiece* on page 50.

## Hand torch operation

**WARNING!**

**INSTANT-ON TORCHES**
**PLASMA ARC CAN CAUSE INJURY AND BURNS**

**Plasma arc ignites immediately when you press the torch trigger. The plasma arc cuts quickly through gloves and skin.**

**Keep hands, clothes, and objects away from the torch tip.**

**Do not hold the workpiece, and keep your hands clear of the cutting path.**

**Never point the torch toward yourself or others.**

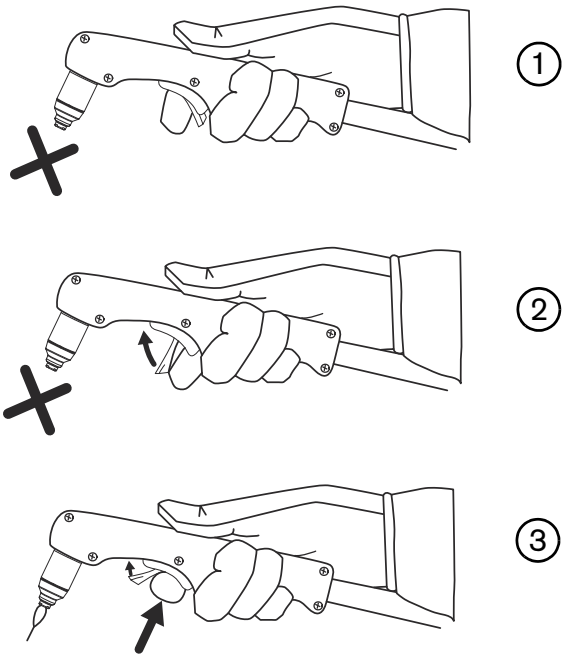
**WARNING!**

**SPARKS AND HOT METAL**
**CAN INJURE EYES AND BURN SKIN**

**Always wear proper protective equipment including gloves and eye protection, and point the torch away from yourself and others. Sparks and hot molten metal spray out from the nozzle.**

### Safety catch operation

The Duramax LT torch is equipped with a safety catch to prevent accidental firings. When you are ready to cut with the torch, flip the safety catch forward (toward the torch head) and press the red torch trigger.

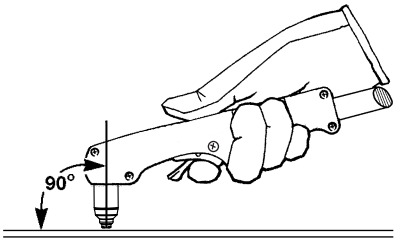


## Hand torch cutting guidelines

- With either set of consumables, drag the torch tip lightly on the workpiece to maintain a steady cut speed.

  Sometimes the torch sticks slightly to the workpiece when you cut with the FineCut consumables.

- While cutting, make sure that sparks exit from the bottom of the workpiece. The sparks should lag slightly behind the torch as you cut (15° – 30° angle from vertical).
- If sparks spray up, you are not cutting all the way through the workpiece. Move the torch more slowly, or, if possible, increase the output current.
- Hold the torch nozzle perpendicular to the workpiece so that the nozzle is at a 90° angle to the cutting surface, and watch the arc as it cuts along the line.

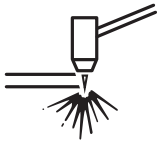



- Pulling the torch toward you along the cut is easier than pushing it or moving from side-to-side.
- For straight-line cuts, use a straight edge as a guide. To cut circles, use a template or a radius cutter attachment (a circle cutting guide). See *Accessory parts* on page 195 for the Hypertherm plasma cutting guide part numbers for cutting circles and making bevel cuts.
- If you fire the torch unnecessarily, you shorten the life of the nozzle and electrode.

### Recommendations for cutting at 120 V

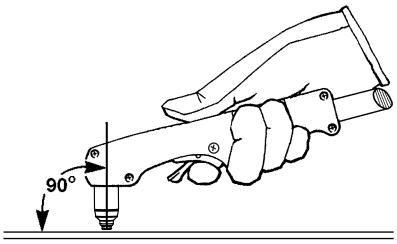
- Use only the FineCut consumables.
- Do not use an extension cord.
- Verify nothing else is drawing power from the circuit.
- Turn down the current adjustment knob to avoid tripping the breaker.

## Edge start on a workpiece

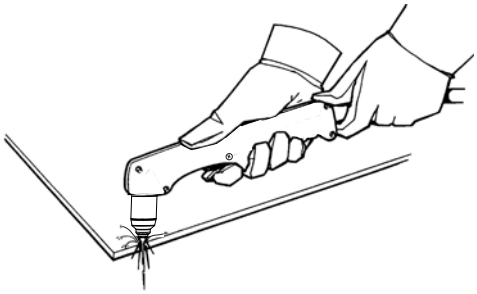


When cutting material thicker than 6 mm (1/4 inch), start the torch at the edge of the workpiece to prolong consumable life.

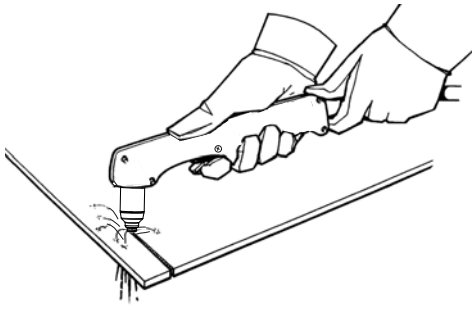
1. With the ground clamp attached to the workpiece, hold the torch perpendicular (90°) to the workpiece and on the edge.



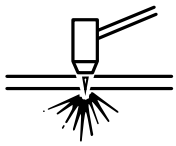

2. Press the torch trigger to start the arc. You may need to pause at the edge until the arc has cut completely through the workpiece.



3. Drag the torch lightly across the workpiece to proceed with the cut. Maintain a steady, even pace.



## Pierce a workpiece



If the metal is thinner than 6 mm (1/4 inch), use piercing to cut an interior feature. Piercing shortens the life of the consumables.

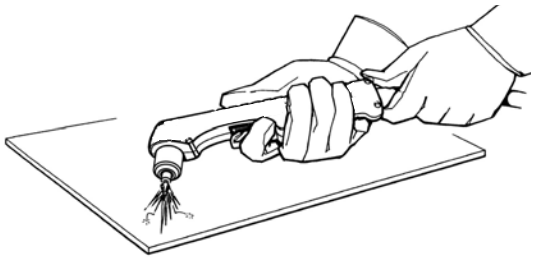
The type of pierce to perform depends on the thickness of the metal. Hypertherm recommends:

- **Straight pierce** – For cutting metal that is thinner than 3 mm (1/8 inch).
- **Rolling pierce** – For cutting metal that is 3 mm (1/8 inch) or thicker.

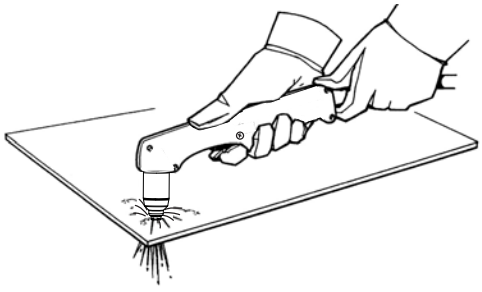
1. Attach the ground clamp to the workpiece.
2. Straight pierce: Hold the torch perpendicular (90°) to the workpiece.

   Rolling pierce: Hold the torch at an approximate 30° angle to the workpiece with the torch tip within 1.5 mm (1/16 inch) of it before firing the torch.
3. Straight pierce: Press the torch trigger to start the arc.

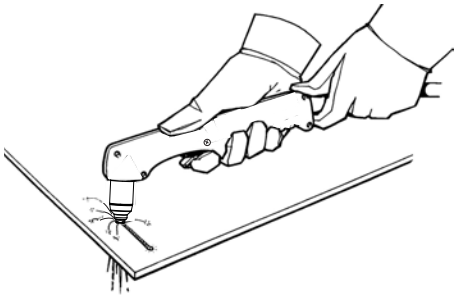
   Rolling pierce: Press the torch trigger to start the arc while still at an angle to the workpiece, then slowly rotate the torch to the perpendicular (90°) position.



4. Hold the torch in place while continuing to press the trigger. When sparks exit from the bottom of the workpiece, the arc has pierced the metal.



5. When the pierce is complete, drag the torch lightly along the workpiece to proceed with the cut.



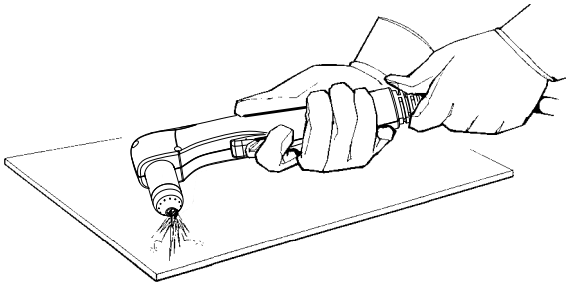
## Gouge a workpiece

You can use the Powermax30 XP with the general-purpose consumables for light gouging applications, such as the removal of spot welds and tack welds.

The system does not require a dedicated set of consumables or a special mode setting for gouging. However, do not use the FineCut consumables for gouging applications.

1. Hold the torch so that the torch tip is slightly above the workpiece before firing the torch.

2. Hold the torch at a 45° angle to the workpiece with a small gap between the torch tip and the workpiece. Press the trigger to obtain a pilot arc. Transfer the arc to the workpiece.

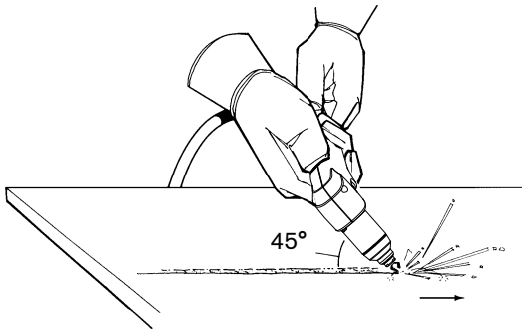


3. Maintain an approximate 45° angle to the workpiece as you feed into the gouge.

   Push the plasma arc in the direction of the gouge you want to create. Keep a small distance between the torch tip and the molten metal to avoid reducing consumable life or damaging the torch.

   You can vary the gouge profile by varying the:

   - Speed of the torch over the workpiece
   - Torch-to-work standoff distance
   - Angle of the torch to the workpiece
   - System's current output




**Varying the gouge profile**

Follow these recommendations to change the gouge profile as needed:

- **Increasing the speed** of the torch will **decrease width** and **decrease depth**.
- **Decreasing the speed** of the torch will **increase width** and **increase depth**.
- **Increasing the standoff** of the torch will **increase width** and **decrease depth**.
- **Decreasing the standoff** of the torch will **decrease width** and **increase depth**.
- **Increasing the angle** of the torch (more vertical) will **decrease width** and **increase depth**.
- **Decreasing the angle** of the torch (less vertical) will **increase width** and **decrease depth**.
- **Increasing the current** of the power supply will **increase width** and **increase depth**.
- **Decreasing the current** of the power supply will **decrease width** and **decrease depth**.

## Common hand-cutting faults

For more information on faults, see *Troubleshooting guide* on page 63.

- The torch sputters and hisses, but does not produce an arc. The cause can be:
  - Overtightened consumables
- The torch does not cut completely through the workpiece. The causes can be:
  - Cut speed is too fast
  - Worn consumables
  - Metal being cut is too thick for the selected amperage
  - Installation of the wrong consumables
  - Poor electrical contact between the ground clamp and the workpiece
  - Low gas pressure or low gas flow rate
- Cut quality is poor. The causes can be:
  - Metal being cut is too thick for the selected amperage
  - Installation of the wrong consumables
  - Cut speed is too fast or too slow
  - Worn or damaged consumables
- The arc sputters and consumables life is shorter than expected. The causes can be:
  - Moisture in the gas supply
  - Low gas pressure
  - Incorrect installation of the consumables
  - Installation of the wrong consumables

### Minimizing dross

Dross is the molten metal that solidifies on the workpiece. Some amount of dross is always present when cutting with air plasma. However, you can control the amount and type of dross by adjusting your system correctly for your application.

Low-speed dross forms when the torch's cutting speed is too slow and the arc shoots ahead. It forms as a heavy, bubbly deposit at the bottom of the cut and is usually easy to remove. Increase your speed to reduce this type of dross.

High-speed dross forms when the cutting speed is too fast and the arc lags behind. It forms as a thin, linear bead of solid metal attached very close to the cut. It forms to the bottom of the cut and is often more difficult to remove. Decrease your speed to reduce this type of dross.

Dross is more likely to form on warm or hot metal than on cool metal. For example, the first cut in a series of cuts is likely to produce the least dross. As the workpiece heats up, more dross may form on subsequent cuts.

Worn or damaged consumables may produce intermittent dross.

# Section 5

# Troubleshooting and System Tests

## Theory of operation

### Functional description

AC power enters the system through the power switch (S1) to the input diode bridges (D24, D30). The voltage from the diode bridge supplies the power factor correction (PFC) boost converter, which provides a nominal 375 VDC bus voltage. The bus voltage then supplies voltage and current to the inverter and the flyback circuit power supply (DC to DC converter) on the power board (PCB2). The power board provides noise suppression and spike protection. A “soft start” is implemented via the power board resistor and relay (K1).

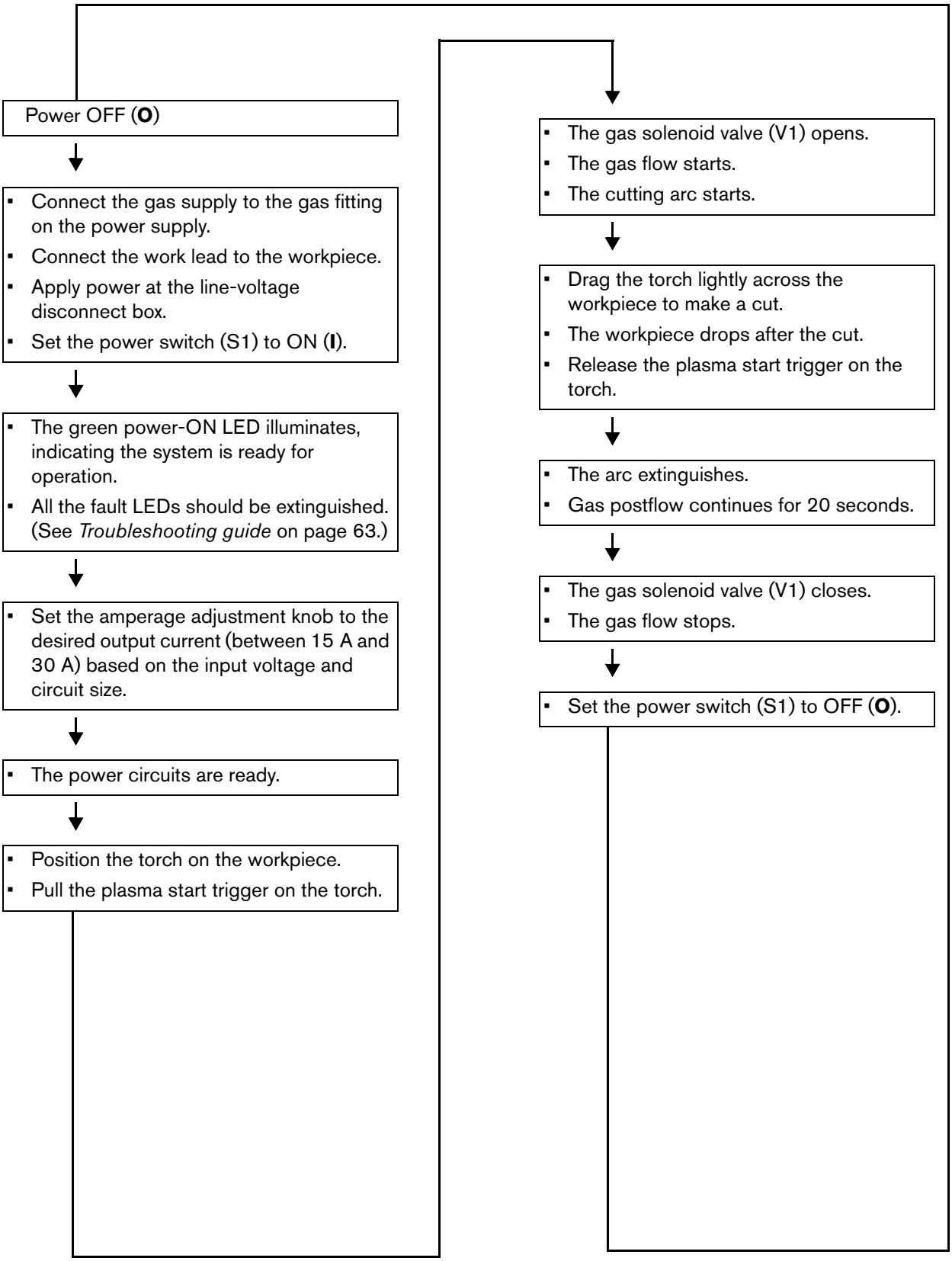
The PFC boost converter consists of an insulated gate bipolar transistor (IGBT Q1), choke, and control circuit. It provides a 375 VDC bus voltage when the input AC voltage is between 120 and 240 VAC.

The inverter consists of an IGBT (Q2), the power transformer, a current-sense transformer, and sections of the power board. The inverter operates as a pulse-width, modulator-controlled bridge circuit that is rectified by the output diode (D27).

The output circuitry consists of two current sensors located on the power board, the pilot arc IGBT (inside the D27 module), and the output choke.

The control board’s microprocessor monitors and regulates the system’s operation and safety circuits. The amperage adjustment knob sets the output current to the desired value between 15 A and 30 A. The system compares the set-point to the output current by monitoring the current sensor and adjusting the pulse-width output of the inverter IGBT (Q2).

## Sequence of operation


Power OFF (O)
Connect the gas supply to the gas fitting on the power supply.
Connect the work lead to the workpiece.
Apply power at the line-voltage disconnect box.
Set the power switch (S1) to ON (I).
The green power-ON LED illuminates, indicating the system is ready for operation.
All the fault LEDs should be extinguished. (See Troubleshooting guide on page 63.)
Set the amperage adjustment knob to the desired output current (between 15 A and 30 A) based on the input voltage and circuit size.
The power circuits are ready.
Position the torch on the workpiece.
Pull the plasma start trigger on the torch.
The gas solenoid valve (V1) opens.
The gas flow starts.
The cutting arc starts.
Drag the torch lightly across the workpiece to make a cut.
The workpiece drops after the cut.
Release the plasma start trigger on the torch.
The arc extinguishes.
Gas postflow continues for 20 seconds.
The gas solenoid valve (V1) closes.
The gas flow stops.
Set the power switch (S1) to OFF (O).

# Troubleshooting preparation

The complexity of the circuits requires that service technicians have a working knowledge of inverter power supply theory. In addition to being technically qualified, technicians must perform all testing with safety in mind.

If questions or problems arise during servicing, call the Hypertherm Technical Services team listed in the front of this manual.

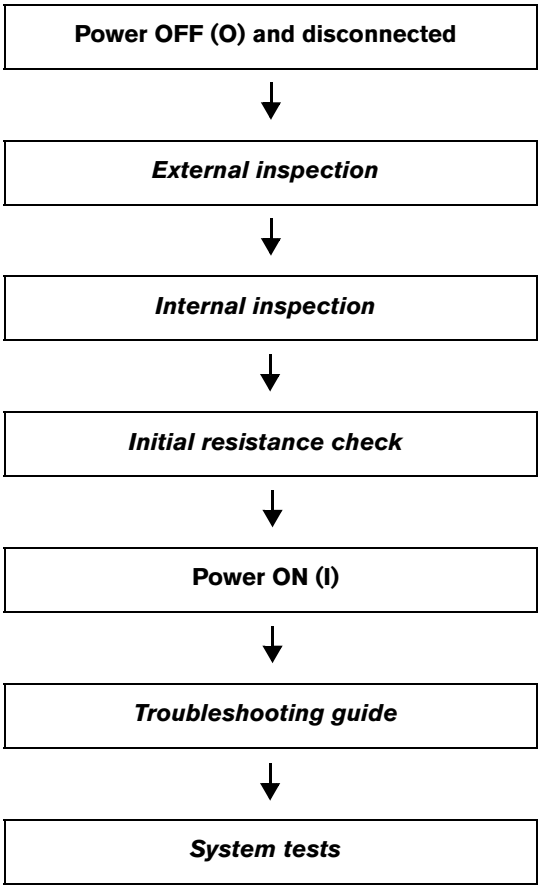
## Test equipment

- Multimeter with a variety of test leads, including test hooks.

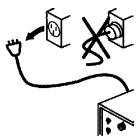
## Troubleshooting procedures and sequence

When performing the troubleshooting procedures, refer to:

- *Safety and Compliance Manual* (80669C) for detailed safety information.
- *Wiring Diagrams* on page 199 for the system's electrical schematic.
- *Power Supply Component Replacement* on page 87 or *Torch Component Replacement* on page 171 for replacement procedures.
- *Parts* on page 185 for power supply components and torch components.



After the problem has been located and repaired, refer to *Sequence of operation* on page 56 to test the power supply for proper operation.

| | |
|---|---|
| | **WARNING!** |
| <br> <br>  | **ELECTRIC SHOCK CAN KILL**<br>**Turn OFF (O) the power and disconnect the electrical power before removing the cover from the power supply. If the power supply is connected directly to a line disconnect box, switch the line disconnect to OFF (O). In the U.S., use a "lock-out / tag-out" procedure until the service or maintenance work is complete. In other countries, follow appropriate national or local safety procedures.**<br>**Do not touch live electrical parts! If power is required for servicing, use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**<br>**Do not attempt to repair the power board or control board. Do not cut away or remove any protective conformal coating from either board. To do so risks a short circuit between the AC input circuit and the output circuit and may result in serious injury or death.** |
| | **HOT PARTS CAN CAUSE SEVERE BURNS**<br>**Allow the power supply to cool before servicing.** |
| | **MOVING BLADES CAN CAUSE INJURY**<br>**Keep hands away from moving parts.** |
| | **STATIC ELECTRICITY CAN DAMAGE CIRCUIT BOARDS**<br>**Put on a grounded wrist strap before handling printed circuit boards.** |

### External inspection

1. Inspect the exterior of the power supply for damage to the cover and external components, such as the power cord and plug.
2. Inspect the torch and the torch lead for damage.
3. Inspect the consumables for damage or wear.
4. Repair or replace components as necessary.

### Internal inspection

1. Set power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)
4. Inspect the inside of the power supply, especially the side with the power board. Look for broken or loose wiring connections, burn and char marks, damaged components, and so on.
5. Repair or replace components as necessary.

## Initial resistance check

All resistance values must be taken with the power cord disconnected and all internal power supply wires attached. Perform the steps in *Internal inspection* (above) before continuing in this section.

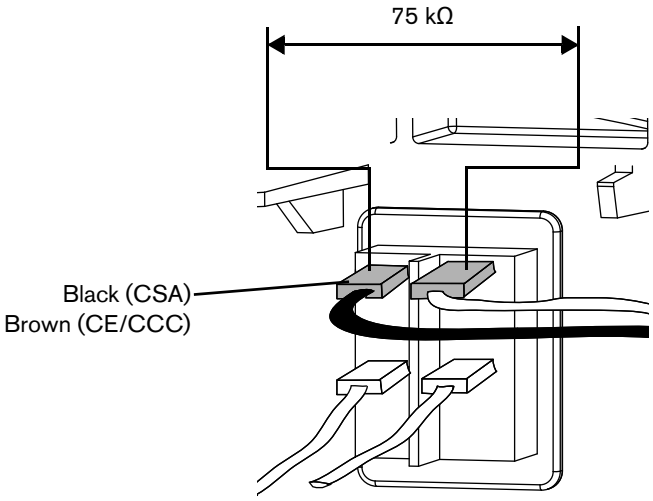
- The type of multimeter you use significantly affects the results of the tests in this section. The resistance values in this manual are intended as a general reference point.
- If resistance values indicate a problem based on the range of values provided in this section, isolate the problem by removing wires attached to the resistance check points or component until the problem is found.
- After the problem is located and repaired, see *Sequence of operation* on page 56 to test the power supply for proper operation.

## Check the power switch

1. Set power switch to OFF (**O**), disconnect the power cord from the power source, and then set the power switch to ON (**I**).

2. Check the resistance across the input leads.

**Figure 6**




3. Check the resistance from the input leads to ground to verify that it reads as open. For all power supplies, the resistance from input to ground should read as > 20 MΩ.

   With the electrical power disconnected and the power switch set to OFF (**O**), all circuits should read as open.

   The electrical value shown is ±25%. However, this range is intended only for reference. Resistance values can vary widely depending on the type of multimeter and the polarity used to measure the readings.

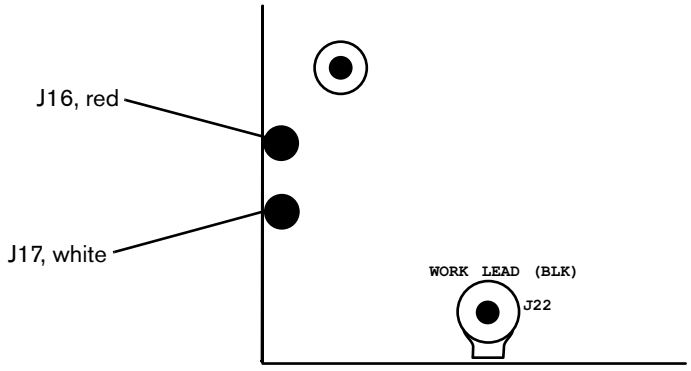
4. Remove the consumables from the torch. If you do not remove the consumables, the resistance values will not read correctly.

**5.** Check the output resistance for the values shown in the following table.

J16 and J17 are labeled on the component side of the power board. See *Figure 7* for locations on the back side of the power board.

| Measure resistance from | Approximate values |
|---|---|
| Work lead (J22) to nozzle (J16, red wire) | 100 kΩ |
| Work lead (J22) to electrode (J17, white wire) | 20 kΩ |
| Electrode (J17, white wire) to nozzle (J16, red wire) | 120 kΩ |
| Work lead (J22), nozzle (J16, red wire), and electrode (J17, white wire) to ground | > 20 MΩ |

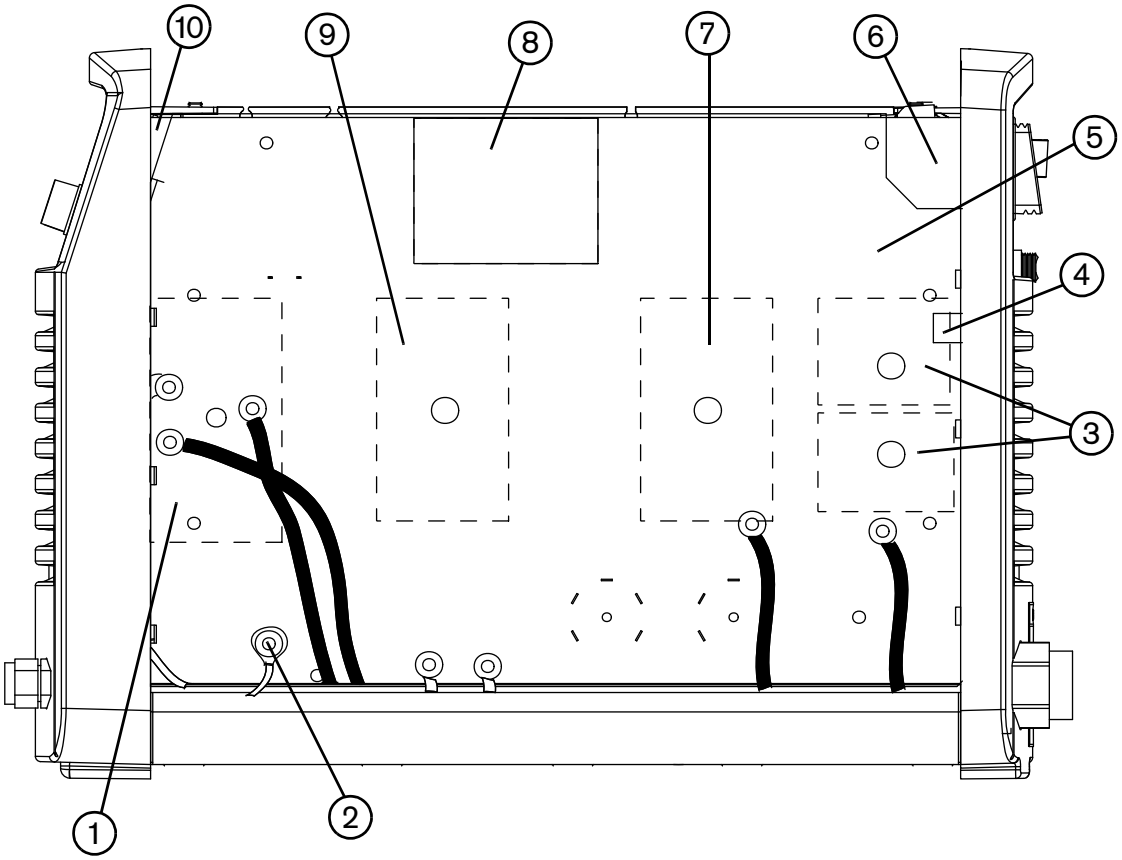
**Figure 7**




**6.** If you do not find any problems during the visual inspection or the initial resistance check, and the power supply is still not operating correctly, see *Troubleshooting guide* on page 63.

## Power supply overview

**Figure 8**

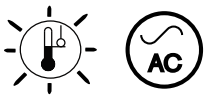
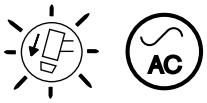


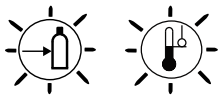
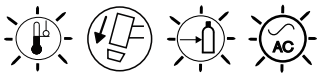
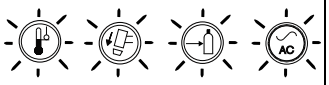

1. Output diode and pilot arc IGBT module (D27)
2. Work lead connection (J22)
3. Input diode bridges (D24, D30)
4. PE (ground)
5. Power board (PCB2)
6. Power switch (S1)
7. PFC IGBT (Q1)
8. Flyback circuit
9. Inverter IGBT (Q2)
10. Control board (PCB1)

## Troubleshooting guide

This guide provides the most probable causes and solutions. Study the *Powermax30 XP schematic* on page 201 and understand the *Theory of operation* on page 55 before troubleshooting. Before purchasing any major replacement component, verify the problem with Hypertherm Technical Service or the nearest Hypertherm repair facility listed in the front of this manual. See *System tests* on page 71 for detailed test procedures.

| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| The power switch is set to ON (**I**), but the power ON LED is not illuminated. | ▪ There is insufficient voltage to the control circuits or a short-circuited power component. | ▪ The system has no incoming voltage or an improper incoming voltage.<br>▪ The power board is faulty. | ▪ Verify that the electrical power is connected to an appropriately sized circuit.<br>▪ Verify that the system did not trip the circuit breaker.<br>▪ Perform *Test 1 – voltage input* on page 74. |
| The power ON LED and the gas pressure LED illuminate.<br> | ▪ There is insufficient gas pressure to the system. | ▪ The gas supply line is not attached to the system.<br>▪ The gas supply line has a restriction.<br>▪ The air filter element is dirty.<br>▪ The pressure switch is not reading at least 2.8 bar (40 psi) on the gas supply line. | ▪ Attach the gas supply.<br>▪ Inspect the gas supply line for restrictions or damage, and repair or replace if necessary.<br>▪ Inspect the air filter element, and replace if necessary. (See *Replacing the air filter bowl and air filter element* on page 148.)<br>▪ Perform *Test 9 – pressure switch* on page 86. |
| The power ON LED and the temperature LED illuminate.<br> | ▪ The system overheated.<br>▪ The system is too cold to operate. | ▪ You have exceeded the duty cycle. (See *Understand duty-cycle limitations* on page 46.)<br>▪ The ambient temperature is too low. | ▪ Inspect the area around the system to make sure that the gas flow is not blocked.<br>▪ Let the system cool before using it.<br>▪ Perform *Test 8 – fan* on page 85.<br>▪ Let the system warm up before using it. |

| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| The power ON LED illuminates and the temperature LED blinks.  | ▪ The system overheated. | ▪ The system is continuously drawing too much input current for too long.<br>▪ You are operating the system on a 120 VAC input circuit while using the general-purpose nozzle and shield. | ▪ Let the system cool for approximately 3 minutes before using it.<br>▪ Turn down the cutting current. See *Adjust the gas pressure and output current* on page 44.<br>▪ Use only the FineCut consumables when operating the system on a 120 VAC input circuit. See *Choose the consumables* on page 32.<br>▪ Operate the system on a 240 VAC input circuit whenever possible.<br>▪ Avoid stretching the arc. Drag the torch on the workpiece. See *Edge start on a workpiece* on page 50.<br>▪ Operate the system without using an extension cord. If you must use an extension cord, use a heavy conductor cord of the shortest possible length. See *Extension cord recommendations* on page 28. |
| The power ON LED blinks. | ▪ The incoming voltage is not correct. | ▪ The incoming voltage is below 90 VAC or above 285 VAC. | ▪ Perform *Test 1 – voltage input* on page 74. |
| The power ON LED and the torch cap LED illuminate. | ▪ The cap-sensing circuit is open. | ▪ The consumables are loose, incorrectly installed, or missing.<br>▪ The cap-sensor switch is faulty. | ▪ Verify that the consumables are installed correctly.<br>▪ Perform *Test 7 – torch cap-sensor* on page 84. |
| The power LED illuminates and the torch cap LED blinks.  | ▪ The consumables are stuck in an open or closed position.<br>▪ The nozzle and electrode are not touching when the torch trigger is pulled. | ▪ The consumables are installed incorrectly, worn, or damaged.<br>▪ The torch plunger is stuck.<br>▪ The torch or torch lead has a broken wire. | ▪ Verify that the consumables are installed correctly.<br>▪ Inspect the consumables for wear, and replace if necessary.<br>▪ Perform *Test 5 – torch stuck open or torch stuck closed* on page 81. |

| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| The gas pressure and temperature LEDs blink when the system is powered ON (**I**).<br>  | ▪ The system was powered on while the plasma start signal was being sent. | ▪ The system was powered on with the torch trigger being pulled.<br>▪ The start circuit is stuck closed. | ▪ Release the torch trigger and reset the system by turning it OFF (**O**), and then turn it ON (**I**) again.<br>▪ Perform *Test 6 – plasma start* on page 82. |
| The temperature, gas pressure, and power ON LEDs blink, and the torch cap LED illuminates.<br>  | ▪ The inverter is saturated. | ▪ The inverter is in an over-current condition.<br>▪ The torch was repeatedly fired with worn out consumables. | ▪ Install new consumables in the torch (they may be corroded or approaching end of life).<br>▪ If you continue to see this error, replace the power board. |
| All four LEDs blink when the system is powered ON (**I**).<br>  | ▪ A major fault has occurred in the power supply. | ▪ The fan, solenoid valve, control board, or power board is faulty. | ▪ The error LED on the control board should be blinking. The number of times it blinks between pauses indicates which components to test. See *Control board LEDs* on page 69. |
| The power-ON LED illuminates but no fault LEDs illuminate, and no gas flows when you pull the torch trigger.<br> | ▪ The start signal is not reaching the control board. | ▪ The torch or torch lead is damaged.<br>▪ The power board is faulty.<br>▪ The control board is faulty. | ▪ Inspect the torch and torch lead, and replace if necessary.<br>▪ Verify that the control board start LED illuminates when you pull the trigger. If it does not, perform *Test 6 – plasma start* on page 82. |
| Gas flows when the system is powered ON (**I**). | ▪ The incoming gas pressure is too high. | ▪ The gas pressure from the compressor or cylinder is too high.<br>▪ The gas solenoid valve is faulty. | ▪ Verify that the gas supply does not exceed 9.3 bar (135 psi), and reduce the pressure if necessary.<br>▪ Perform *Test 4 – solenoid valve* on page 80. |

| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| When you pull the torch trigger, gas flows from the torch, but the torch does not fire or fires only for a short period of time. | ▪ The consumables, torch, or torch lead are not functioning correctly.<br>▪ The gas pressure is too low.<br>▪ The gas supply quality is poor.<br>▪ There is a voltage imbalance on the power board. | ▪ The consumables are worn or damaged.<br>▪ The torch or torch lead is damaged.<br>▪ The gas supply line is restricted.<br>▪ The air filter element is dirty.<br>▪ The power board is faulty. | ▪ Inspect the consumables, torch, and torch lead, and replace if necessary.<br>▪ Inspect the gas supply line for restrictions or damage.<br>▪ Inspect the air filter element, and replace if necessary. (See *Replacing the air filter bowl and air filter element* on page 148.)<br>▪ Verify that the gas supply is providing at least 4.5 bar (65 psi).<br>▪ Perform *Test 3 – VBUS and voltage balance* on page 78. |
| Arc goes out while cutting or intermittently will not fire. | ▪ The work lead connection is poor. | ▪ The work lead is damaged or not properly connected to the workpiece. | ▪ Inspect for loose connections at the ground clamp and at the power supply, and repair if necessary.<br>▪ Reposition the work lead on the workpiece.<br>▪ Clean the cutting surface to make a better connection with the work lead. |
| When you pull the torch trigger, the pilot arc starts but then extinguishes before the normal 5-second timeout period. | ▪ The consumables, torch, or torch lead is not functioning correctly.<br>▪ The gas pressure is too low.<br>▪ The gas supply quality is poor.<br>▪ There is a voltage imbalance on the power board. | ▪ The consumables are worn or damaged.<br>▪ The torch or torch lead is damaged.<br>▪ The gas supply line is restricted.<br>▪ The air filter element is dirty.<br>▪ The power board is faulty. | ▪ Inspect the consumables, torch, and lead, and replace if necessary.<br>▪ Inspect the gas supply line for restrictions or damage.<br>▪ Inspect the air filter element, and replace if necessary. (See *Replacing the air filter bowl and air filter element* on page 148.)<br>▪ Verify that the gas supply is providing at least 4.5 bar (65 psi).<br>▪ Perform *Test 3 – VBUS and voltage balance* on page 78. |

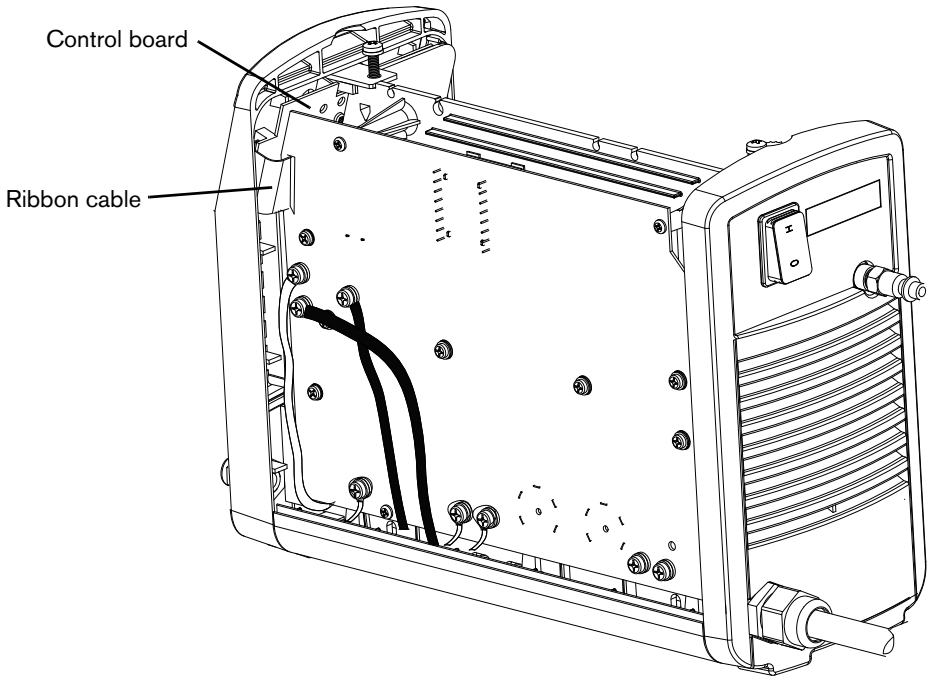
| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| The cut quality is poor, or the cut does not sever the metal. | ▪ The consumables are not functioning correctly.<br>▪ There is a poor work lead connection.<br>▪ The output from the power supply is too low.<br>▪ The power board is producing low current.<br>▪ The extension cord is not delivering sufficient power to the power supply. | ▪ The consumables are worn or damaged.<br>▪ The work lead is damaged or not properly connected to the workpiece.<br>▪ The amperage adjustment knob is set too low.<br>▪ The power board is faulty.<br>▪ The extension cord is too long, is damaged, or is not capable of delivering sufficient power to the power supply. | ▪ Inspect the consumables and replace if necessary.<br>▪ Inspect the work lead and replace if necessary.<br>▪ Reposition the work lead on the workpiece.<br>▪ Clean the workpiece surface to make a better connection with the work lead.<br>▪ If your input circuit allows, turn the amperage adjustment knob to a higher setting.<br>▪ Operate the system without using an extension cord. If you must use an extension cord, use a heavy conductor cord of the shortest possible length. See *Extension cord recommendations* on page 28. |
| The pilot arc extinguishes when you move the plasma arc off the workpiece while still pulling the torch trigger. | ▪ The continuous pilot arc is not functioning correctly. | ▪ The power board or the control board is faulty. | ▪ Perform *Test 2 – power board voltage checks* on page 76 and *Test 3 – VBUS and voltage balance* on page 78. |

| Problem | This may mean | Possible cause(s) | Possible solution(s) |
|---|---|---|---|
| The circuit breaker trips frequently while you are cutting. | ▪ The output from the power supply is too high.<br>▪ The wrong consumables are being used.<br>▪ The power supply is not receiving enough input power.<br>▪ The operator is stretching the arc while cutting.<br>▪ The extension cord is not delivering sufficient power to the power supply. | ▪ The amperage adjustment knob is set too high for the input circuit.<br>▪ The general-purpose nozzle and shield are being used with an input circuit of 120 VAC.<br>▪ The input circuit is not delivering sufficient power to the power supply.<br>▪ The operator is holding the torch too far from the workpiece when cutting.<br>▪ The extension cord is too long, is damaged, or is not capable of delivering sufficient power to the power supply. | ▪ Turn down the cutting current. See *Adjust the gas pressure and output current* on page 44.<br>▪ Use only the FineCut consumables when operating the system on a 120 VAC input circuit. See *Choose the consumables* on page 32.<br>▪ Operate the system on a 240 VAC input circuit whenever possible.<br>▪ Avoid stretching the arc. Drag the torch on the workpiece. See *Edge start on a workpiece* on page 50.<br>▪ Operate the system without using an extension cord. If you must use an extension cord, use a heavy conductor cord of the shortest possible length. See *Extension cord recommendations* on page 28.<br>▪ Verify nothing else is drawing power on the same circuit. |

## Control board LEDs

The Powermax30 XP control board (PCB1) is located inside of the front panel.

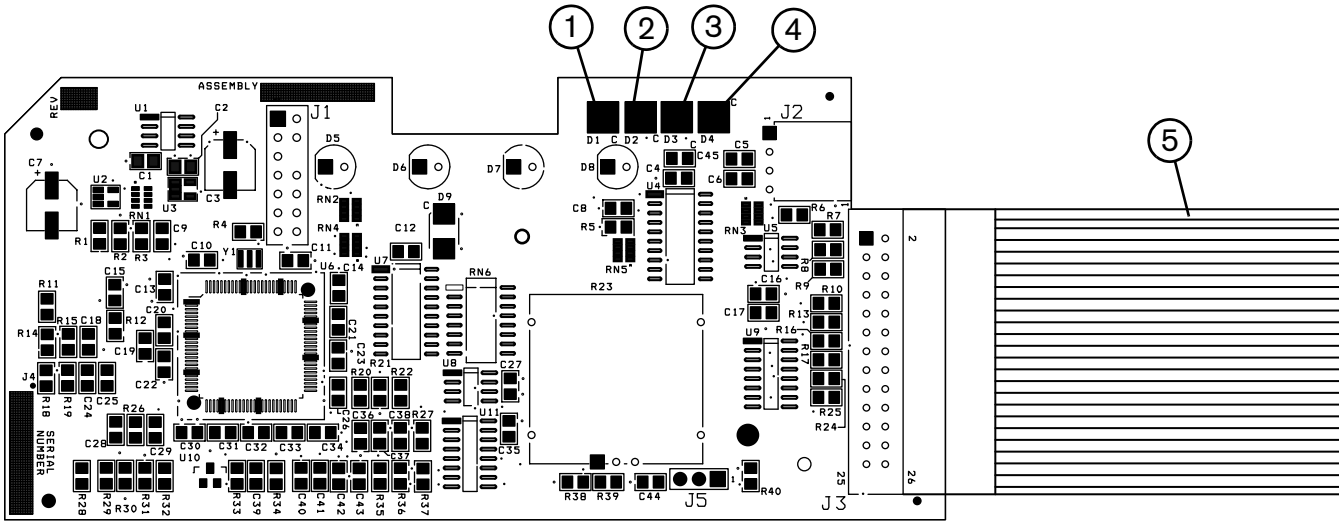
**Figure 9**




The control board has four diagnostic LEDs:

- **Reset** – This LED illuminates when a voltage reading is out of range or the Reset LED blinks.
- **Error** – This LED illuminates when the gas pressure, torch cap, or temperature LEDs on the front of the power supply illuminate. If all four LEDs on the front of the power supply are blinking, the Error LED also blinks. The number of blinks between pauses indicates which component may have failed.
- **Transfer** – This LED illuminates when there is proper arc transfer between the torch and the workpiece, and blinks during continuous pilot arc operation (such as when cutting expanded metal or moving the arc off the plate and then back on).
- **Start** – This LED illuminates when the power supply receives a start signal and remains illuminated during normal operation.

**Figure 10**




1 Reset/watchdog
2 Error
3 Transfer (XFR)
4 Start
5 Ribbon cable

During normal operation, the power-ON LED on the front of the power supply and the Start and Transfer LEDs on the control board illuminate. When a problem occurs with the system, one or more of the fault LEDs on the front of the power supply and the Error LED or the Reset LED on the control board may illuminate or blink.

## Use the control board Error and Reset LEDs to troubleshoot

The Reset and Error LEDs provide information to use when troubleshooting a system failure. If the LEDs on the front of the power supply are blinking, count the number of times the Error LED blinks. Then, look at the following table to determine the corrective action.

### Reset LED

When the control board's Reset LED illuminates, the voltages on the power board may be incorrect. Perform the following tests at J7 on the power board. (See *Test 2 – power board voltage checks* on page 76.)

- Test pin 5 to ground for 3.3 VDC (±10%).
- Test pin 7 to ground for 5 VDC (±10%).
- Test pin 12 to ground for 2.2 VDC (±10%).

If the values you find are not within ±10% of the three values listed above, detach the control board's ribbon cable and perform the tests again. If you find the correct values the second time, replace the control board. (See *Replacing the control board* on page 107.) Otherwise, replace the power board. (See *Remove the power board* on page 109.)

### Error LED

The number of times the Error LED blinks indicates the problem detected. Each blink is a half-second long, and each series of blinks is separated by a 2-second pause. See *System tests* on page 71 for detailed test procedures.

| Number of blinks | Problem | Solution |
|---|---|---|
| 3 | Faulty power board | ▪ Perform *Test 3 – VBUS and voltage balance* on page 78. If any of the values are incorrect, replace the power board.<br>▪ Perform *Test 2 – power board voltage checks* on page 76. If any of the values for pins *5*, 7, or *12* are incorrect, remove the control board and test again. If the values are correct, replace the control board.<br>▪ When performing *Test 2 – power board voltage checks* on page 76, if the values for pins *5*, 7, or *12* are correct, but any other values are incorrect, replace the power board. |
| 4 | Faulty fan or solenoid valve | ▪ Perform *Test 4 – solenoid valve* on page 80 and *Test 8 – fan* on page 85. If the solenoid valve test and the fan test both pass, replace the power board. If Test 4 fails, replace the solenoid valve; if Test 8 fails, replace the fan. |
| 6 | Inverter saturation | ▪ Install new consumables in the torch. If you continue to see this error code, replace the power board. |

## System tests

You can use either the ground clip near the top of the rear panel or the ground screw on the heatsink (marked by the ground symbol on the power board) for any tests that require the multimeter to be attached to ground. See *Figure 11* for both grounding options.

**Figure 11**

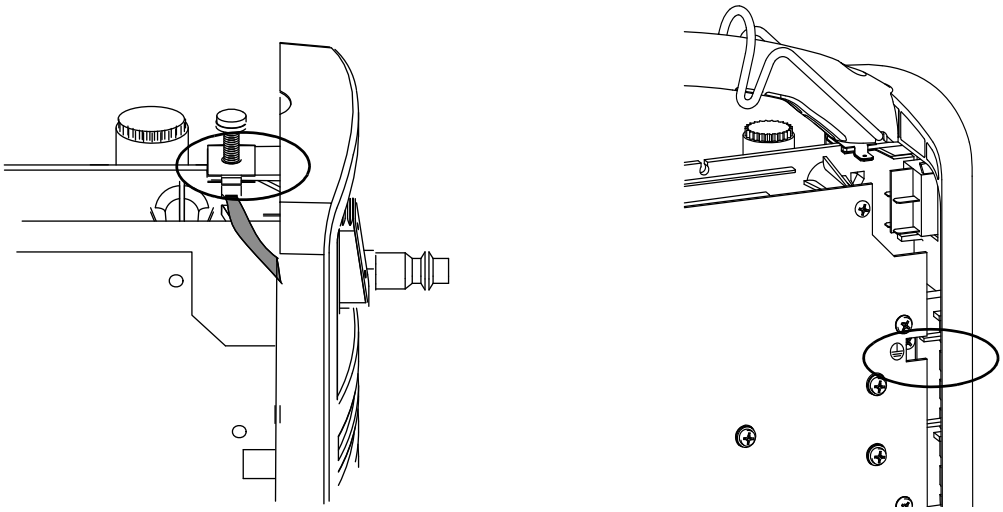
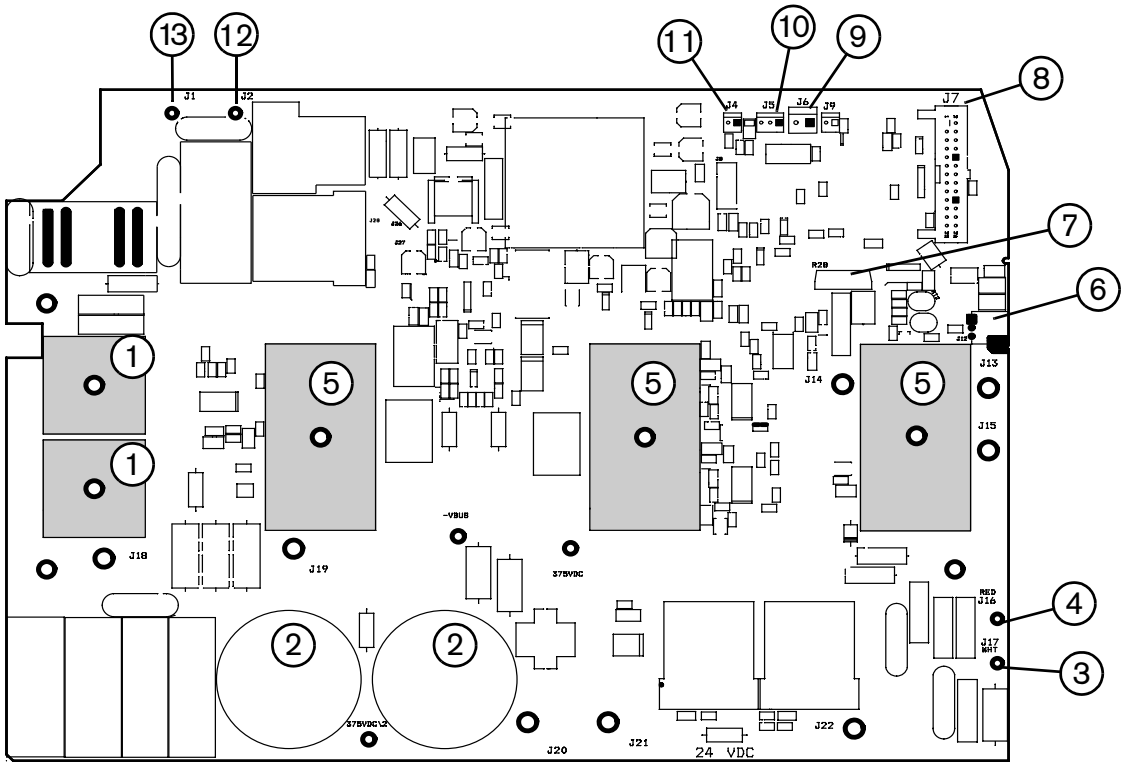


**Figure 12**




**1** Input diode bridges

**2** Capacitors

**3** J17 (white)

**4** J16 (red)

**5** IGBTs

**6** J12 (torch-start, cap-sensor switch connector)

**7** Snubber resistor

**8** Ribbon cable connector (J7)

**9** J6

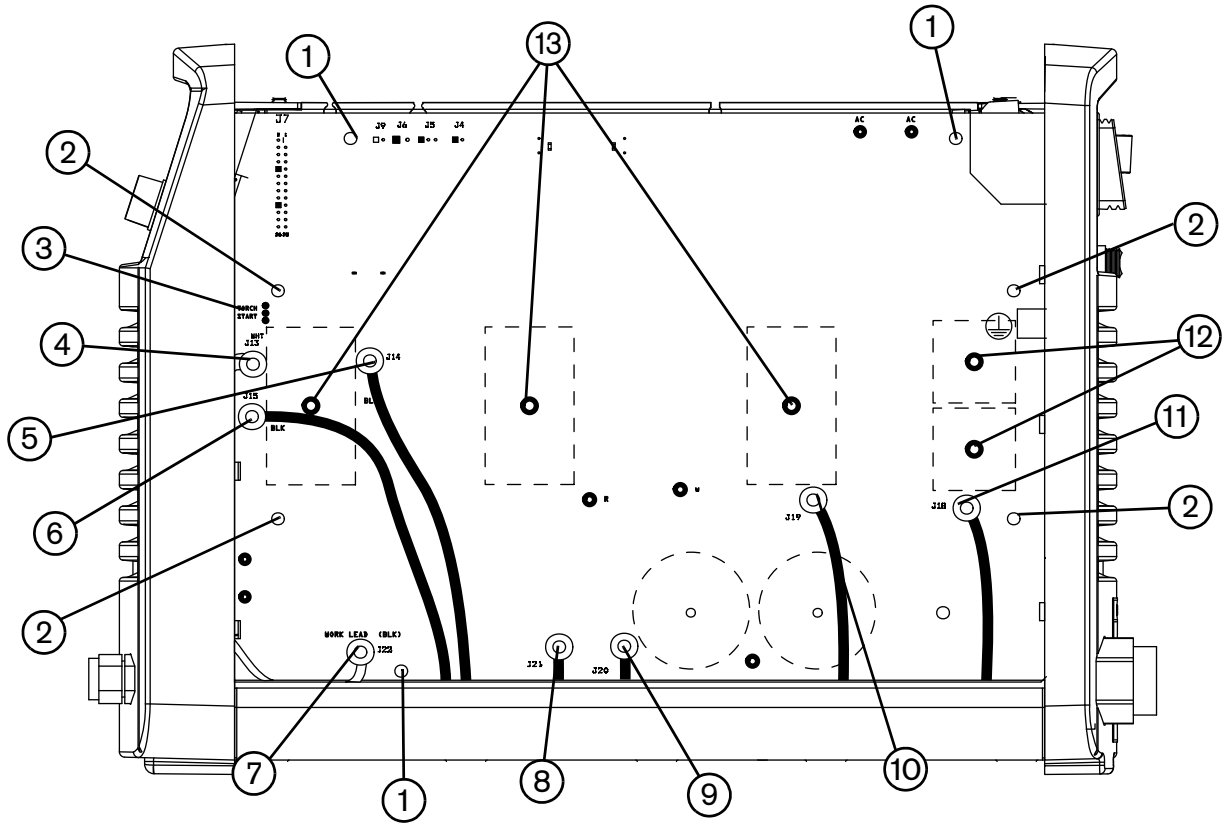
**10** J5

**11** J4

**12** J2

**13** J1

**Figure 13**




**1** Retaining screw (3)

**2** Heatsink assembly screw (4)

**3** Torch start and cap-sensor (J12)

**4** J13

**5** J14

**6** J15

**7** Work lead connector (J22)

**8** J21

**9** J20

**10** J19

**11** J18

**12** Input diode bridge screws (2)

**13** IGBT screws (3)

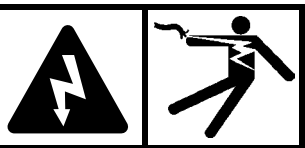
**WARNING!**

**Voltages of up to 50 VDC continue to be present on the DC bus for at least 30 seconds after disconnecting the input power. Allow bus voltages to dissipate before performing any tests.**

## Test 1 – voltage input

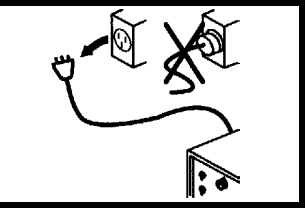
Check the incoming voltage and the line voltage to the top of the power switch (S1).

1. Set power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)
4. Partially pull the power switch's top two wires out from the tabs and attach the multimeter test leads to the tabs to check the AC voltage.



**WARNING!**

**ELECTRIC SHOCK CAN KILL**



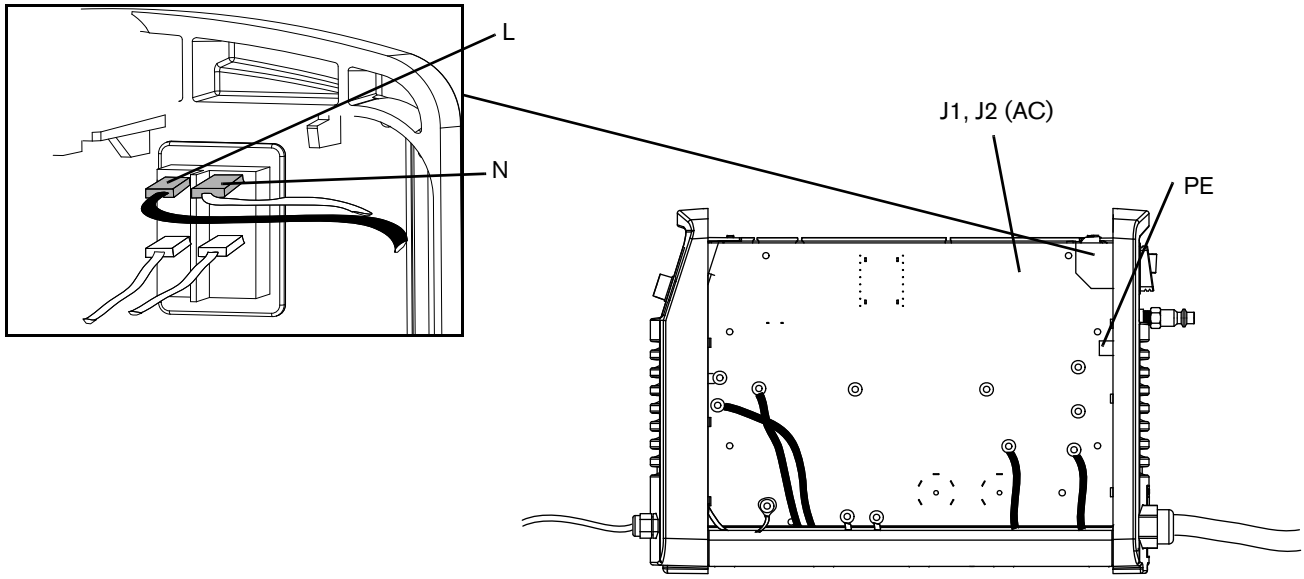
**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

5. Once you have the test leads in place, leave the power switch set to OFF (**O**), and reconnect the electrical power. The voltage should equal the line voltage of the incoming circuit, for example 120 V or 240 V.

All values can be ±15%.

**Figure 14**




| Single phase power supplies | | |
|---|---|---|
| **Designator** | **CSA wire colors** | **CE/CCC wire colors** |
| L (live) | Black | Brown |
| N (neutral) | White | Blue |
| PE (ground) | Green | Green/yellow |

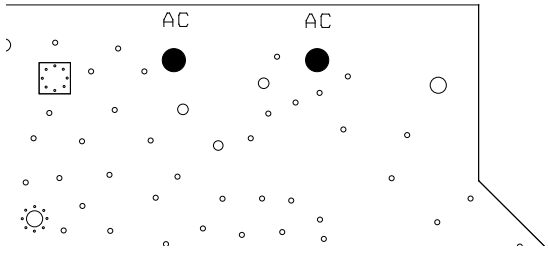
**6.** If the AC voltage is incorrect, verify that you have power to the unit. If you do have power, inspect the power cord for damage, and replace if necessary. (See *Remove the power cord and strain relief* on page 98.)

**7.** If the power source and power cord are functioning correctly, disconnect the power cord again and reconnect the two wires to the power switch.

**8.** Reconnect the electrical power and set the power switch to ON (**I**).

**9.** Measure the AC voltage from J1 to J2 (labeled “AC” on the back of the power board). This value should be the same as the incoming line voltage. If it is not, check the power switch and replace if necessary.

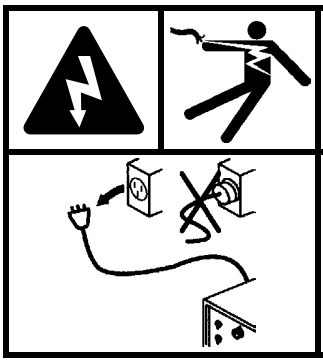
**Figure 15**




**10.** If the power-ON LED is still illuminated, perform *Test 2 – power board voltage checks* on page 76.

## Test 2 – power board voltage checks

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)



**WARNING!**

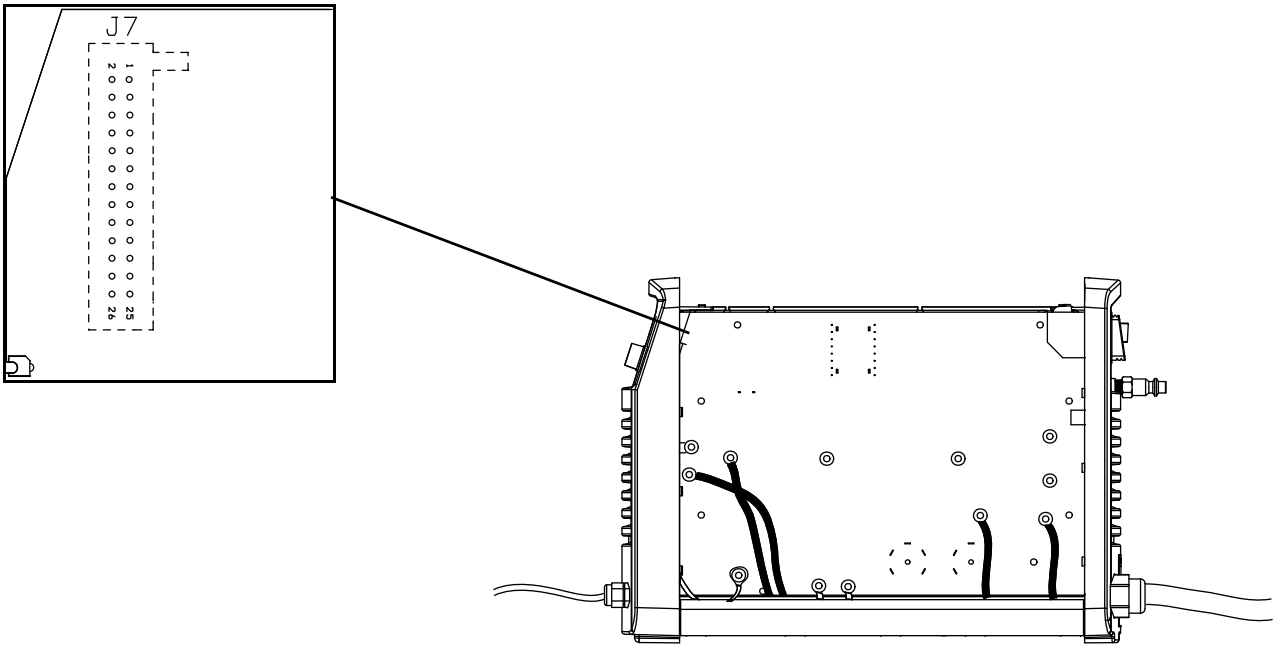
**ELECTRIC SHOCK CAN KILL**

**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

4. Reconnect the electrical power and set the power switch to ON (**I**).
5. Use a multimeter to verify the voltages at the J7 pins listed in the following table to verify the power board is functioning correctly.

**Figure 16**




To test the values at pin 16, you must position the torch and power supply so that you can safely pull and release the torch trigger. For ground locations, see *Figure 11* on page 71. If any of the values are incorrect, replace the power board. (See *Remove the power board* on page 109.)

**CAUTION!**

**Do not use -VBUS (W) as ground. Doing so could destroy the power supply. Instead ground to either the ground wire clip on the rear panel or to the heatsink. (See *Figure 11* on page 71.)**

All values can be ±10%.

| J7 pin number to ground | Test | Expected value |
|---|---|---|
| 19 | VACR (rectified AC line voltage) | 0.86 V at 120 line voltage<br>1.87 V at 230 line voltage |
| 21 | VBUS (DC bus voltage) | 2.28 VDC at 375 VBUS |
| 18 | IPFC (input current) | < 0.1 VDC |
| 20 | IFB (output current) | < 0.1 VDC |
| 22 | ITF (transfer current) | < 0.1 VDC |
| 5 | 3.3 VDC | 3.3 VDC ±10% |
| 7 | 5 VDC | 5 VDC ±10% |
| 12 | 24 V sense pin | 2.2 VDC |
| 16 | Start signal | 3.2 VDC closed<br>0 VDC open |

## Test 3 – VBUS and voltage balance

Test the power board to verify that the circuits are balanced. The test points are labeled on the back of the power board, as are the voltages and positive and negative capacitor terminals. See *Figure 18* on page 79 for locations of test points.

**CAUTION!**

**Do not use a multimeter with test leads. This can cause a short-circuit between the BUS and the heatsink. Use test hook leads instead, and attach them to the test point loops.**

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)

**WARNING!**

**ELECTRIC SHOCK CAN KILL**

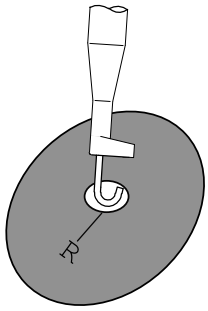
**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

4. Reconnect the electrical power.

Carefully connect the test hooks to the edges of the holes in the power board so that the hook makes contact with the ring on the back side of the power board.

**Figure 17**



**5.** Measure the voltage from W to R. (See *Figure 18*.)

**a.** Position the test hooks on W and R on the power board.

**b.** Turn the power ON (**I**).

**c.** The multimeter should read 375 VDC.

If you get a value other than 375 VDC, multiply the reading by 0.00601 to convert it to millivolts. Test pin 21 on J7. (See *Test 2 – power board voltage checks* on page 76.) If the values match, it is a normal reading.

**6.** Measure the voltage from W to B.

**a.** Turn the power OFF (**O**).

**b.** Move the test hooks to W and B.

**c.** Turn the power ON (**I**).

**d.** This value should be 187.5 VDC or one-half of the value found in step 5.

**7.** Measure the voltage from R to B.

**a.** Turn the power OFF (**O**).

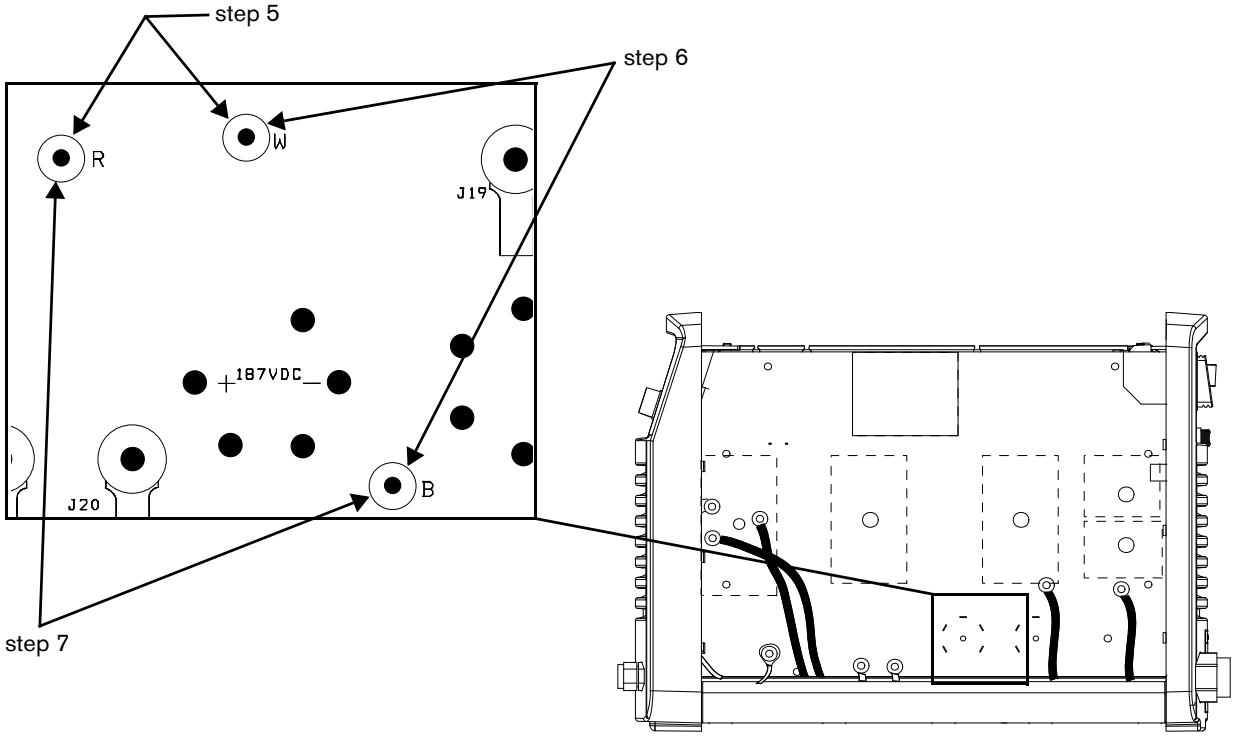
**b.** Move the test hooks to R and B.

**c.** Turn the power ON (**I**).

**d.** This value should be 187.5 VDC or one-half of the value found in step 5.

**8.** The values found in step 6 and step 7 should be approximately equal. If they differ by more than 30 V, replace the power board.

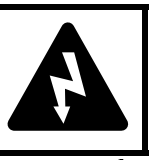
**Figure 18**



## Test 4 – solenoid valve

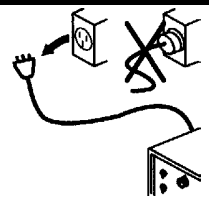
This test verifies the proper operation of the solenoid valve (V1).

1. Set the power switch to OFF (**O**) and disconnect the power cord from the power source.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)



**WARNING!**

**ELECTRIC SHOCK CAN KILL**

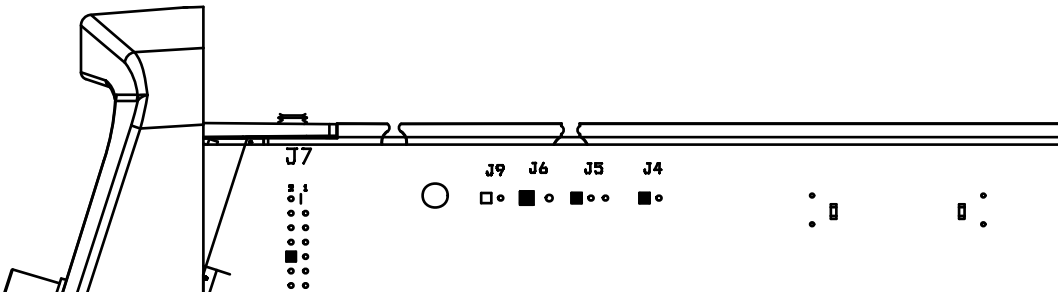


**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

4. Reconnect the electrical power.
5. Place a jumper from pin 4 of J6 on the power board (see *Figure 12* on page 72 for location) to ground (see *Figure 11* on page 71).

**Figure 19**




6. Turn the power ON (**I**). The valve should click.
7. Measure the voltage between pin 4 of J6 and ground.
8. If you do not hear the valve click and the voltage check reads 24 VDC, replace the solenoid valve. (See *Replacing the solenoid valve* on page 130.)

## Test 5 – torch stuck open or torch stuck closed

If the nozzle and electrode are not in contact before the torch trigger is pressed, the power supply detects a “torch stuck open” fault. If the nozzle and electrode are in contact after the torch trigger is pressed, the power supply detects a “torch stuck closed” fault.

Use the following test to determine if the torch is stuck in either position.

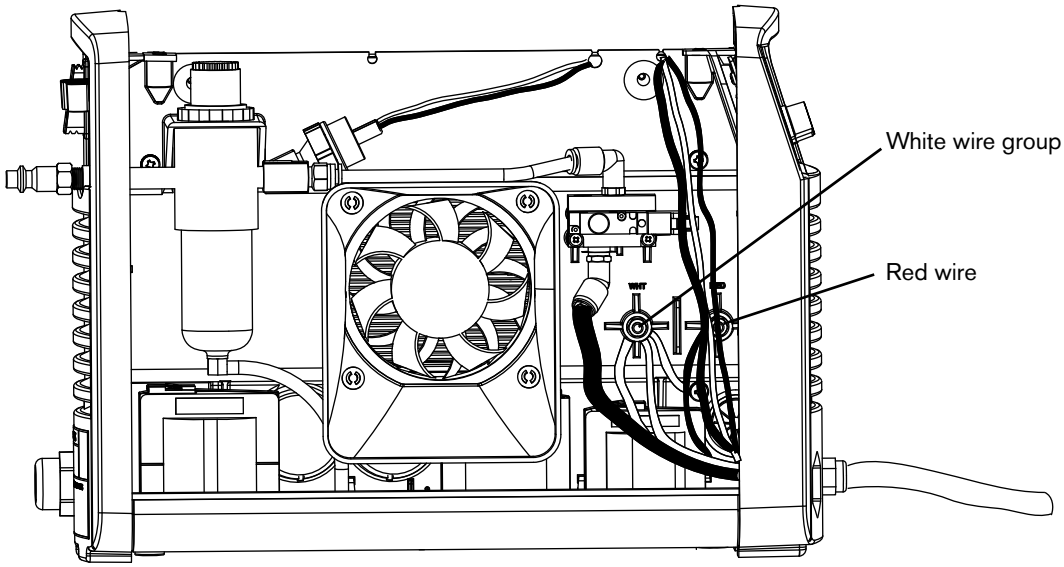
1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)

**CAUTION!**

**To avoid causing a short or damage to the multimeter, do not fire the torch with the multimeter connected to the power board.**

4. Measure the resistance from the torch lead’s white wire group and red wire. The resistance should read very low, a closed circuit.

**Figure 20**




5. Turn ON (**I**) the power and measure the resistance between the same points. The resistance should read very high, an open circuit.
6. If the resistance reads as open, the nozzle and electrode are not in contact, or one of the wires in the lead is broken.
7. If the resistance reads as closed, the nozzle and electrode are in contact or one of the wires in the torch lead is broken. Make sure that the torch plunger moves freely in the torch head.

8. In either case, make sure that the torch plunger moves freely in the torch head.

9. If it does not, replace the torch body. (See *Replacing the torch body* on page 178.) If the torch parts are working properly, replace the torch lead. (See *Replacing the torch lead* on page 182.)

10. Because “torch stuck open” and “torch stuck closed” failures can be intermittent, repeat the test several times.

## Test 6 – plasma start

Verify that the control board LED is receiving a valid start signal.

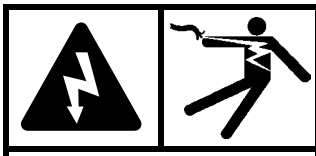
1. Set the power switch to OFF (**O**) and disconnect the power cord from the power source.

2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)

3. Remove the component barrier. (See *Remove the component barrier* on page 90.)

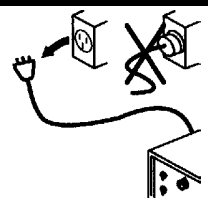
**CAUTION!**

**While testing, avoid any contact with the tip of the torch.**



**WARNING!**

**ELECTRIC SHOCK CAN KILL**



**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

4. Connect the electrical power and turn the power ON (**I**).

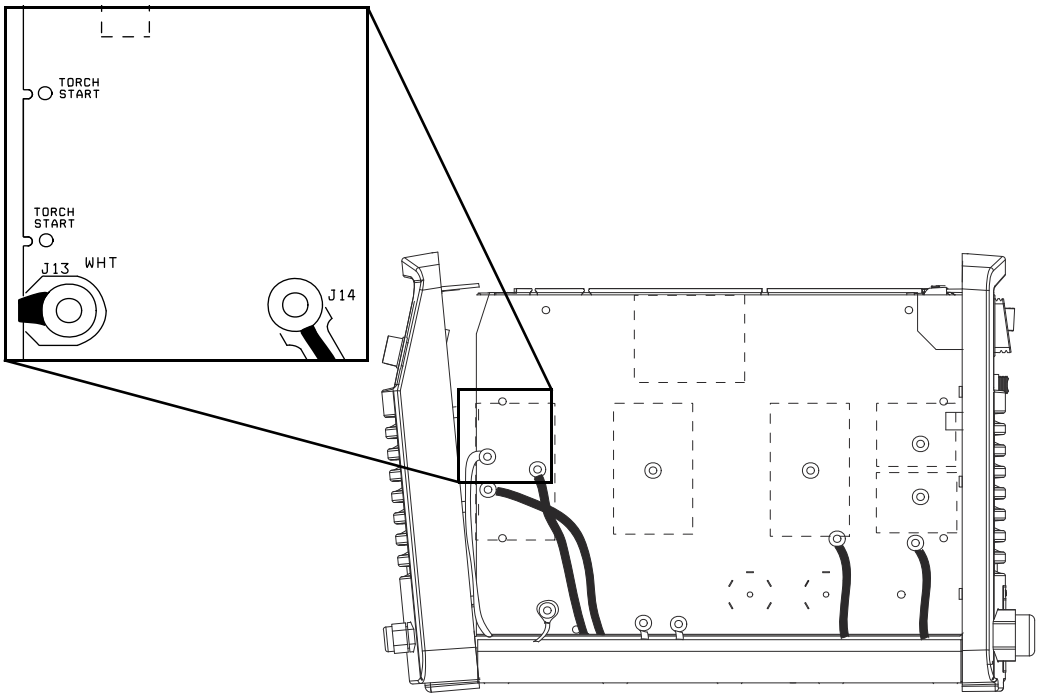
5. Look at the Start LED on the control board (see *Control board LEDs* on page 69 for the location of the Start LED) and pull the torch trigger. It should illuminate whenever the trigger is pulled.

6. Turn OFF (**O**) the power.

7. Check the resistance at the 2 torch-start test points on the power board.
   a. With the trigger pulled, the resistance should 10 Ω or less.
   b. With the trigger released, the circuit should read approximately 3 kΩ.

8. If this test fails, check the torch start-switch and the torch wires.

**Figure 21**




**9.** Turn ON (**I**) the power.

**10.** Measure pin 16 of J7 to ground. (See *Test 2 – power board voltage checks* on page 76.)

- **a.** With the trigger pulled, it should measure as 0 VDC for an open circuit.
- **b.** With the trigger released, it should measure 3.2 VDC for a closed circuit.

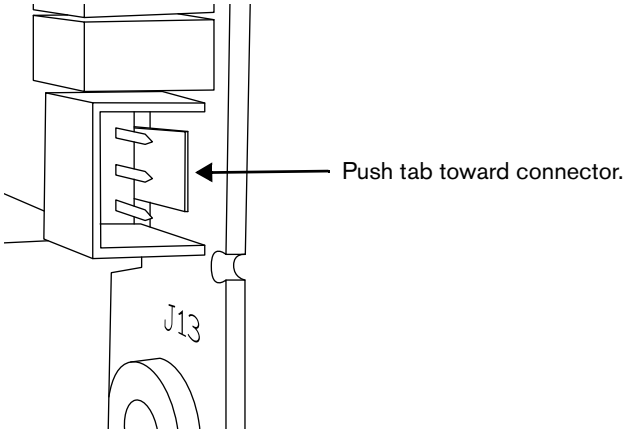
**11.** If the values are not correct, replace the power board. (See *Remove the power board* on page 109.)

## Test 7 – torch cap-sensor

Test the cap-sensor switch and torch leads.

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)
4. Detach the front panel. (See *Detach the front panel* on page 92.)
5. Disconnect the cap-sensor connector at J12 on the heatsink side of the power board by pushing the tab on the connector toward the plug and pulling the plug out.

**Figure 22**

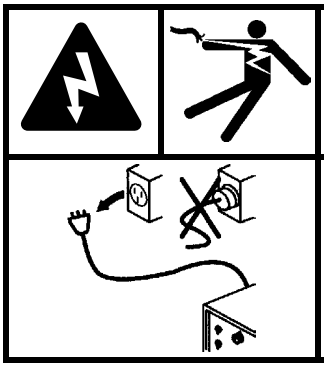



6. Measure the resistance from the orange wire to the blue wire. It should measure less than 10 Ω. If it measures high resistance, the cap-sensor switch circuit is open.
7. Make sure the torch plunger moves smoothly. If it does not, replace the torch body. (See *Replacing the torch body* on page 178.)
8. Make sure the consumables are correctly installed. Adjust the consumables if necessary.
9. If the torch parts mentioned in step 7 and step 8 are working properly, the cap-sensor switch is faulty or the torch lead has a broken wire. Replace the faulty part. (See *Replacing the cap-sensor switch* on page 181 or *Replacing the torch lead* on page 182.)

## Test 8 – fan

Test the fan (M1) for proper operation.

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)
4. Place a jumper from ground (see *Figure 11* on page 71) to pin 3 of J5 (see *Figure 12* on page 72).



**WARNING!**

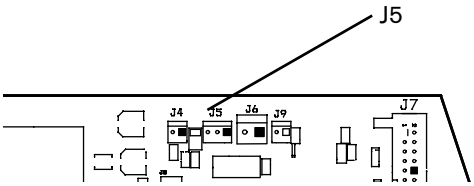
**ELECTRIC SHOCK CAN KILL**

**Use extreme caution when working near live electrical circuits. Dangerous voltages exist inside the power supply that can cause serious injury or death.**

**See the *WARNING!* on page 58 before proceeding.**

5. Reconnect the electrical power and set the power switch to ON (**I**).
6. If the fan does not operate, replace the fan. (See *Replacing the fan* on page 116.)

**Figure 23**




Because of protection features on the fan driver chip, this test can trigger a fault. You can disregard this fault if it occurs as a result of a fan test. The purpose of the fan test is to verify that the fan is operating properly, not to test the fan drive circuit.

## Test 9 – pressure switch

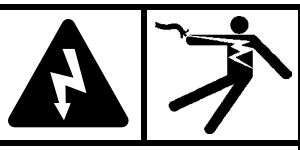
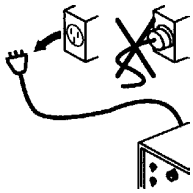
Test the pressure switch to verify that the system is receiving the proper gas pressure.

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the power supply handle and cover. (See *Remove the power supply cover* on page 88.)
3. Remove the component barrier. (See *Remove the component barrier* on page 90.)
4. Measure the resistance between pins 1 and 2 of J4. If there is no gas pressure, it should read approximately 4.7 kΩ. If the gas pressure is within system tolerances as outlined in the *Hypertherm system ratings* on page 19, the circuit should read as closed.
5. Replace the pressure switch, if necessary. (See *Replacing the pressure switch* on page 139.)

The minimum acceptable gas pressure varies by torch lead length.

## Section 6

## Power Supply Component Replacement

| | |
|---|---|
|  | **WARNING!**<br>**ELECTRIC SHOCK CAN KILL** |
|  | **Disconnect electrical power before performing any maintenance.**<br>**All work requiring removal of the power supply cover must be performed by a qualified technician.**<br>**See the *Safety and Compliance Manual* (80669C) for more safety precautions.** |

| | |
|---|---|
| | **CAUTION!** |
| | **Static electricity can damage circuit boards. Use proper precautions when handling printed circuit boards.**<br>**Store PC boards in anti-static containers.**<br>**Wear a grounded wrist strap when handling PC boards.** |

## Disconnect the power and gas supply

1. Set the plasma power supply switch to OFF (**O**).
2. Disconnect the power cord from the power source.
3. Disconnect the gas supply hose from the plasma power supply.

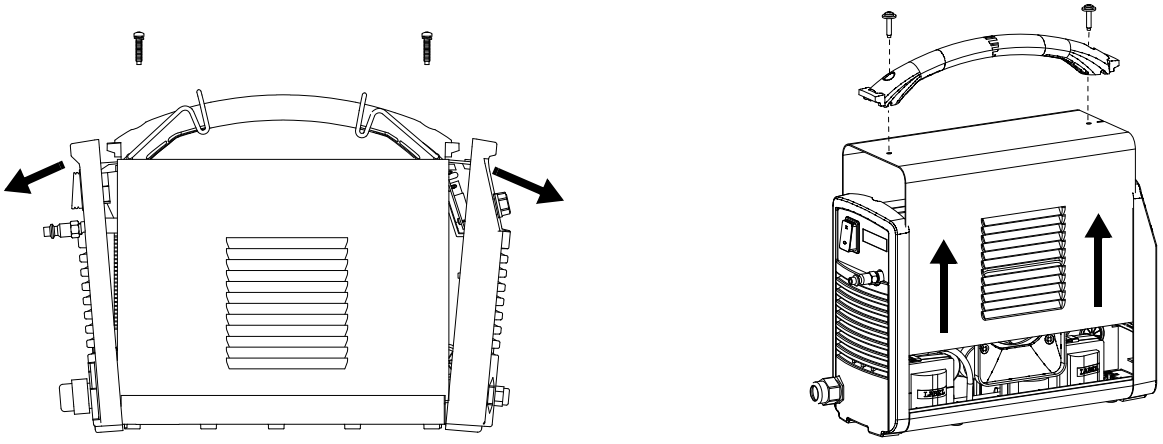
## Replacing the power supply cover

| Kit number | Description |
|---|---|
| *428221* | *Kit: Power supply cover with labels, CSA* |
| *428222* | *Kit: Power supply cover with labels, CSA, Built in America* |
| *428224* | *Kit: Power supply cover with labels, CE* |
| *428225* | *Kit: Power supply cover with labels, CCC* |

### Remove the power supply cover

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the two screws from the handle on the top of the power supply. Gently pull on the panel nearest the screw you are removing to keep pressure on the screw. When the screw is almost out, tilt the screwdriver slightly to help pull the screw out of the recessed hole.
3. Slightly tip the front and rear panels away from the power supply so that you can get the edges of the handle out from underneath them. Remove the handle, and set it and the two screws aside.
4. Continue to tilt the panels outward to release the fan side of the cover from its track. Then lift the cover off the power supply.

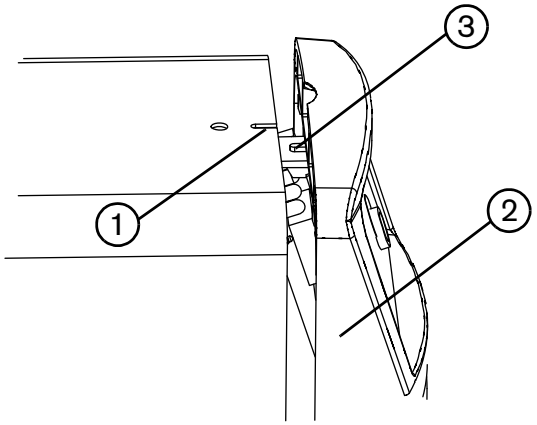
**Figure 24**



## Install the power supply cover

1. Being careful not to pinch any wires, slide the cover onto the power supply. Align the bottom edges with the tracks, and align the slot in the top of the cover with the tab on the front panel so that the louvers in the cover are in front of the fan.

**Figure 25**




**1** Cover slot

**2** Front panel

**3** Tab

2. Realign the front panel with the power supply.
3. Realign the rear panel with the power supply, making sure that the hole in the ground clip is aligned with the screw holes in both the panel and the power supply.
4. Position the handle over the holes in the top of the cover, and position the ends of the handle underneath the edges of the panels.
5. Reinstall the two screws that attach the cover and handle with a torque setting of 23.0 kg-cm (20 inch-pounds).
6. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

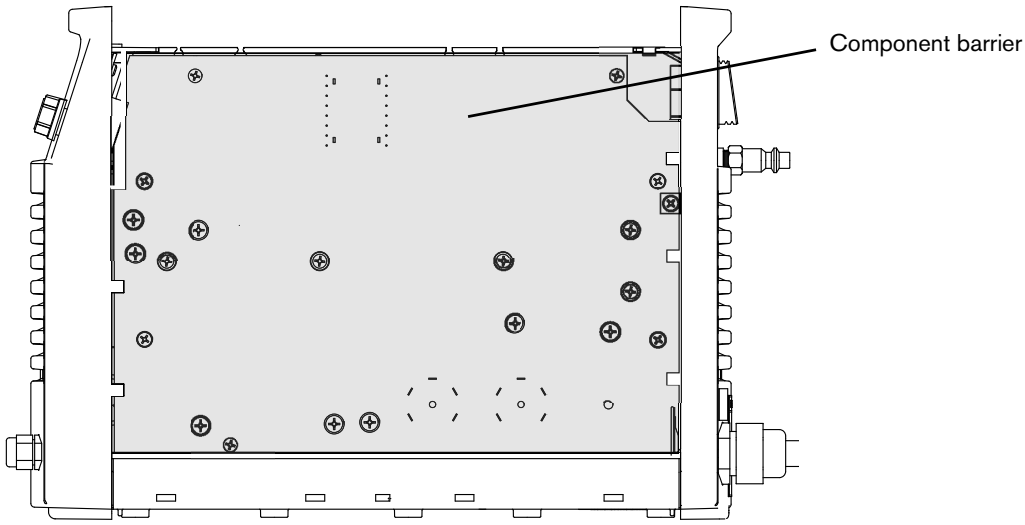
## Replacing the component barrier

| Kit number | Description |
|---|---|
| *228104* | *Kit: Component barrier* |

### Remove the component barrier

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the component barrier from the power board side of the power supply. The barrier is flexible and can be bent slightly for removal.

**Figure 26**



## Install the component barrier

1. Hold the component barrier so that the edge with the long cutout and the two notches is closest to the rear panel, and the edge with the three notches is closest to the front panel.

2. A perforated line runs across the top of the barrier, about 25 mm (1 inch) below the top edge. Fold the barrier along this perforation so that the top edge bends away from you.

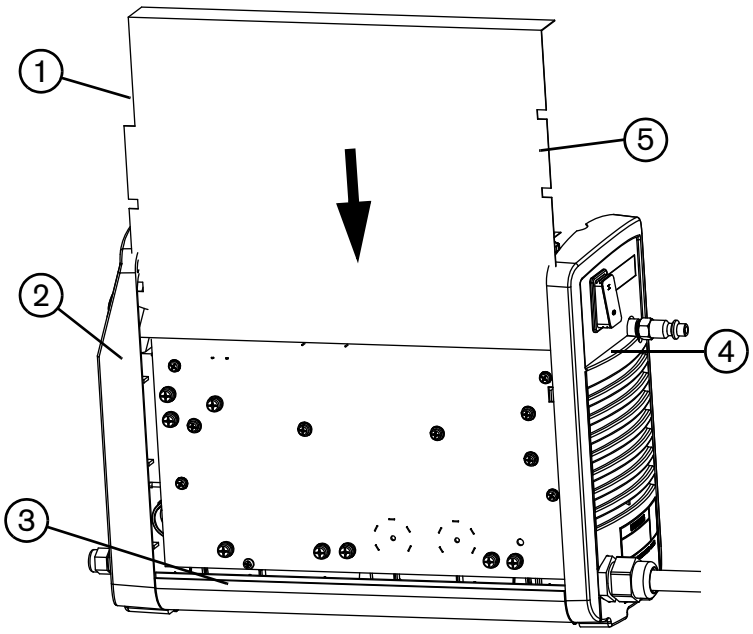
3. Position the barrier so that the folded section will cover the top of the power board. The edge with the long cutout and the two notches should align with the front panel; the edge with the three notches should align with the rear panel.

4. Put the front-panel edge of the barrier in place first, then the rear-panel edge. The notches on each side of the barrier should align with the ribs on the inside of the front and rear panels. As you slide the barrier into place, make sure the bottom edge is between the wires at the bottom of the power board and the side of the plastic base.

   The barrier will not fit in the same track with the power supply cover.

5. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 27**




**1** Component barrier edge with long cutout and two notches

**2** Front panel

**3** Track

**4** Rear panel

**5** Component barrier edge with three notches

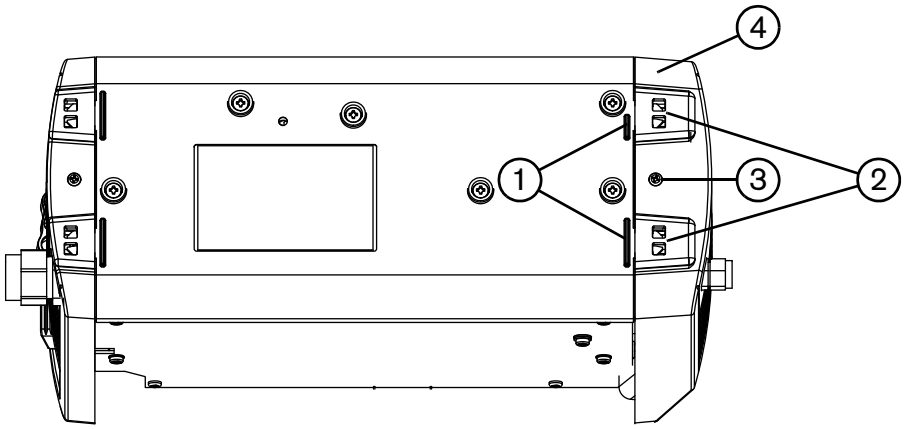
## Detaching and reattaching the front panel

Several repairs are easier to make if you first detach the front panel from the power supply. For instructions on replacing an old front panel with a new one, see *Replacing the front panel* on page 152.

### Detach the front panel

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Loosen the strain relief nuts on the torch lead and work lead.
3. Lay the power supply on its side.
4. Remove the retaining screw from the bottom of the front panel.

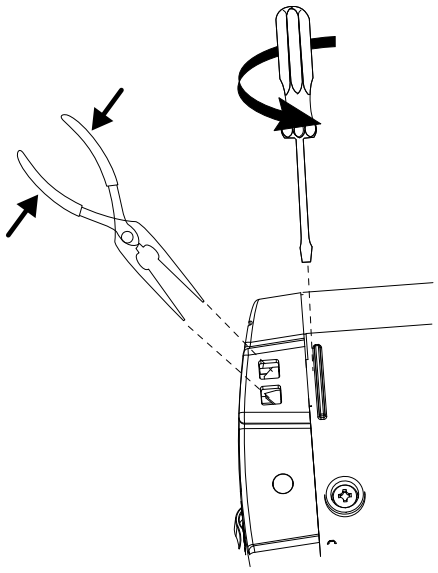
**Figure 28**




**1** Raised rib
**2** Snap
**3** Retaining screw
**4** Front panel

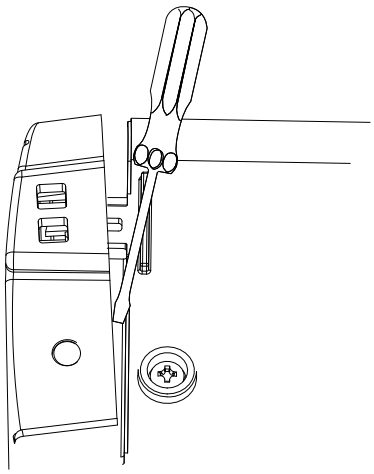
5. Insert needle nose pliers into the opening for one of the snaps, and use the pliers to squeeze it together.
6. Place a blade screwdriver against the raised rib next to the snap, and gently turn the screwdriver to push the panel away from the base.

**Figure 29**



**7.** Place another screwdriver or similar object into the opening between the panel and the base to keep the first corner of the panel from re-engaging the snaps when you release the other corner.

**Figure 30**



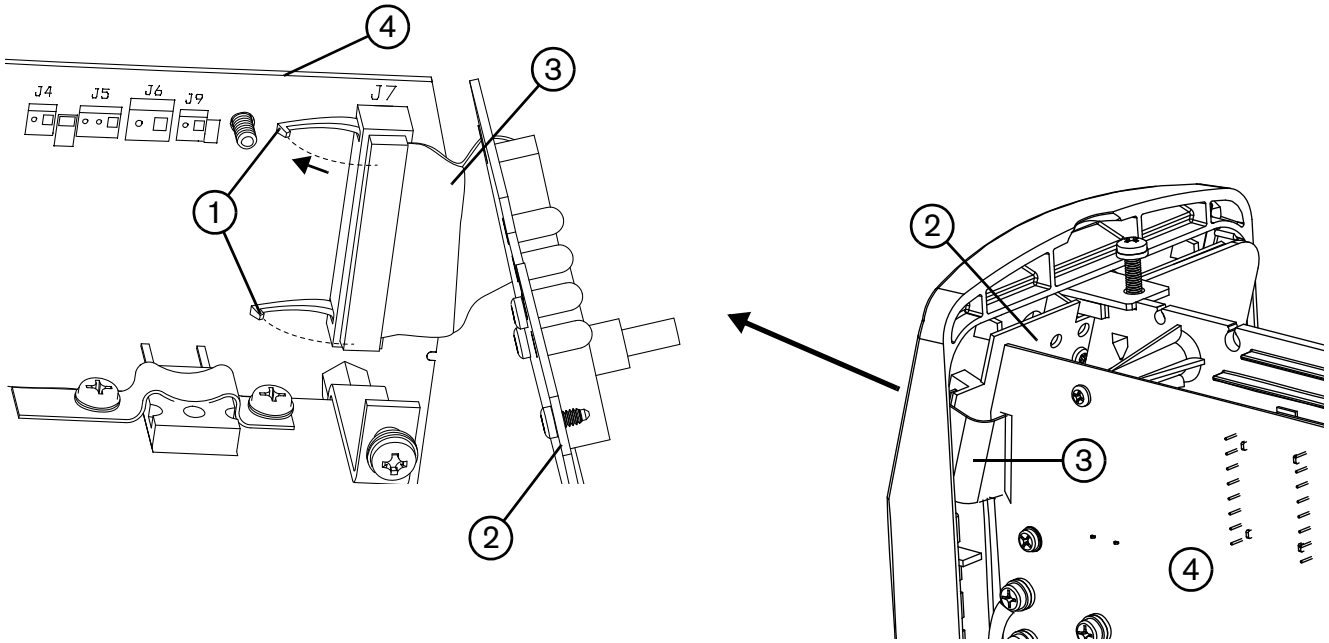
**8.** Repeat step 5 and step 6 on the other corner of the panel.

**9.** Disconnect the control panel ribbon cable from the power board by folding the latches back.

In *Figure 31*, the center panel is hidden in the image on the left.

**10.** Gently pull the panel away from the power supply.

**Figure 31**




**1** Latches

**2** Control board

**3** Ribbon cable

**4** Power board

## Reattach the front panel

1. Push the front panel into the base of the power supply to re-engage the snaps.
2. Tighten the retaining screw with a torque setting of 8.1 kg-cm (7 inch-pounds). (See *Figure 28* on page 92.)
3. Reconnect the control board's ribbon cable to the power board.
4. Tighten the strain relief nut on the torch lead and work lead.
5. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

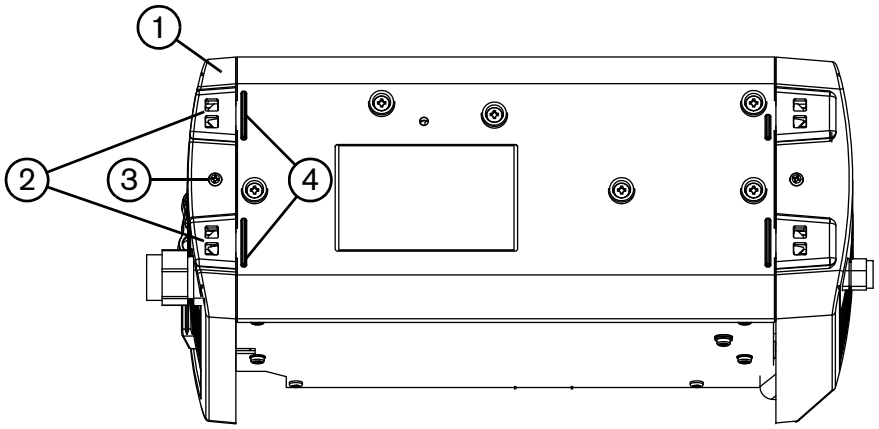
## Detaching and reattaching the rear panel

Several repairs are easier to make if you detach the rear panel from the power supply. For instructions on replacing an old rear panel with a new one, see *Replacing the rear panel* on page 156.

### Detach the rear panel

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Loosen the power cord's strain relief nut.
3. Lay the power supply on its side.
4. Remove the retaining screw from the bottom of the rear panel.

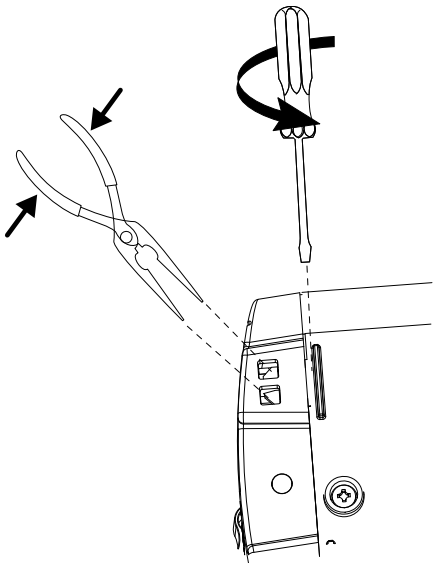
**Figure 32**




**1** Rear panel
**2** Snap
**3** Retaining screw
**4** Raised rib

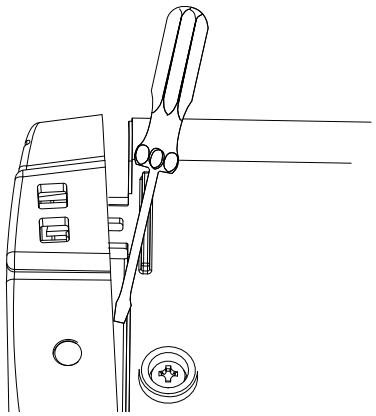
5. Insert needle nose pliers into the opening for one of the snaps and use the pliers to squeeze it together.
6. Place a blade screwdriver against the raised rib next to the snap and gently turn the screwdriver to push the panel away from the base.

**Figure 33**



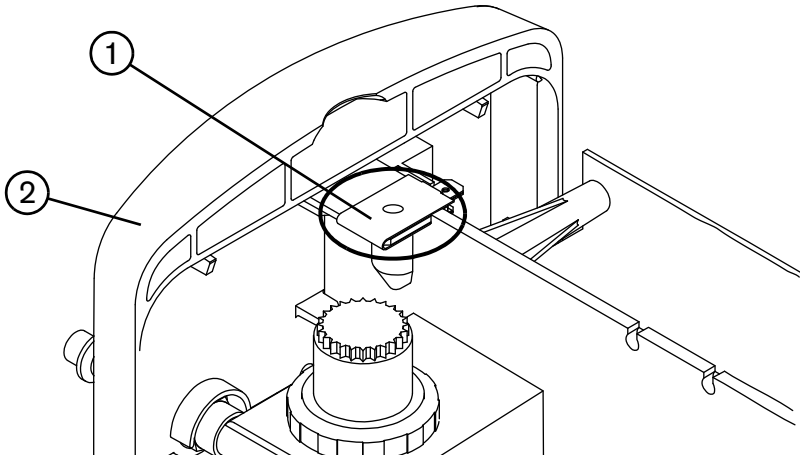
7. Place another screwdriver or similar object into the opening between the panel and the base to keep the first corner of the panel from re-engaging the snaps when you release the other corner.

**Figure 34**



8. Repeat step 5 and step 6 on the other corner of the panel.
9. Disconnect the ground wire from the ground wire clip near the top of the rear panel. (See *Figure 35*.)
10. Gently pull the panel away from the power supply.

**Figure 35**




**1** Ground wire clip

**2** Rear panel

## Reattach the rear panel

1. Push the rear panel into the base to re-engage the snaps.
2. Verify the hole in the ground wire clip is aligned with the screw holes in the rear panel and the power supply. (See *Figure 35*.)
3. Tighten the retaining screw with a torque setting of 8.1 kg-cm (7 inch-pounds). (See *Figure 32* on page 95.)
4. Reconnect the ground wire to the ground wire clip.
5. Tighten the strain relief nut on the power cord.
6. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

# Replacing the power cord and strain relief

| Kit number | Description |
|---|---|
| *228210* | *Kit: CSA power cord with NEMA twist lock-style 240 V / 20 A plug, 1-phase, 3.0 m (10 feet)* |
| *228140* | *Kit: CE power cord, 1-phase, 3.0 m (10 feet) (plug not included)* |
| *428231* | *Kit: CCC power cord, 1-phase, 3.0 m (10 feet) (plug not included)* |
| *228143* | *Kit: Power cord strain relief* |

## Remove the power cord and strain relief

### CSA power cords

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
   d. See *Detach the rear panel* on page 95.
2. Remove the black and white wires from the top of the power switch.

**Figure 36**

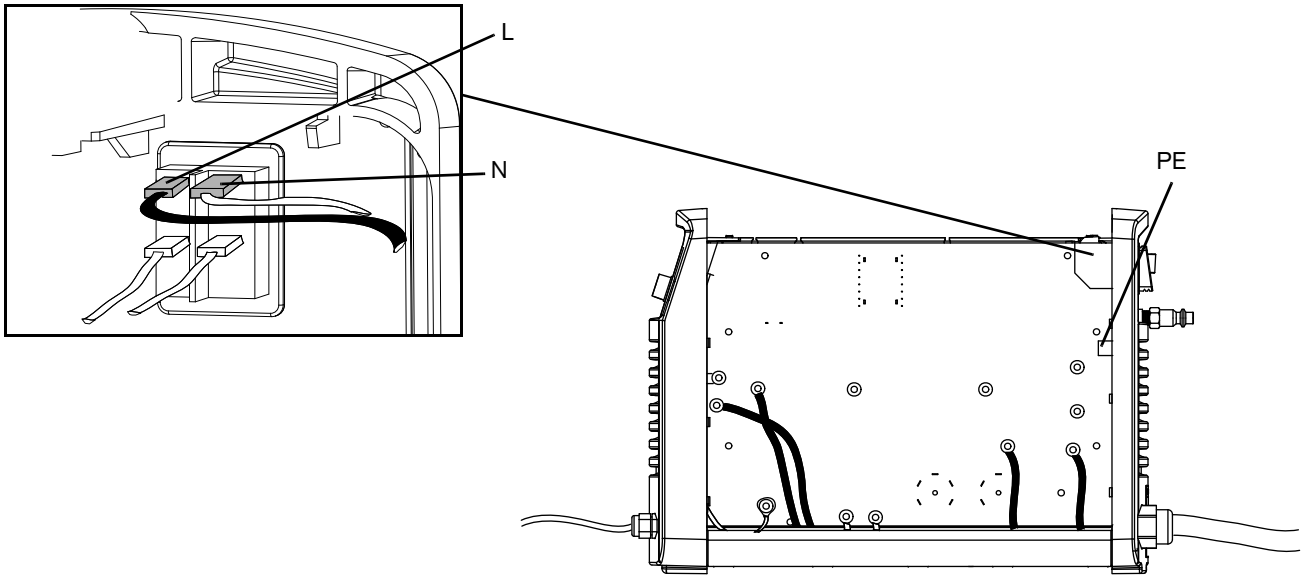


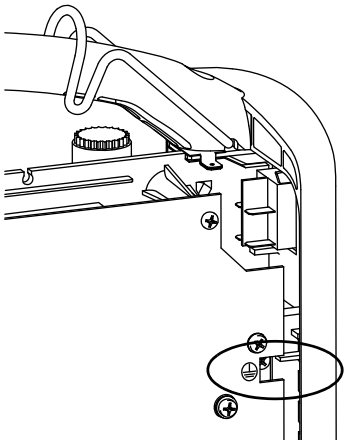
**Table 1 – Single-phase CSA power cord wires**

| Designator | Wire color |
|---|---|
| L (live) | Black |
| N (neutral) | White |
| PE (ground) | Green |

The power cord has a black wire and a white wire that connect to the power switch and a green ground wire that connects to the heatsink.

**3.** Remove the screw that holds the ground wire to the heatsink. A notch in the power board provides access to the screw. (See *Figure 37*.)

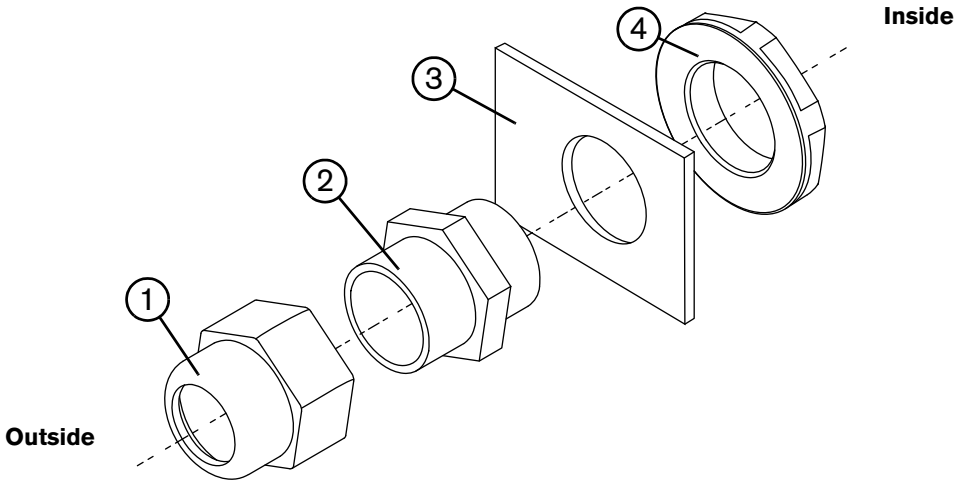
**Figure 37**



4. On the outside of the power supply, loosen the strain relief nut so that the wires move freely.

5. Are you replacing the strain relief?
   - ❑ If yes, use an adjustable wrench to unscrew the retention nut on the inside of the power supply.
   - ❑ If no, continue with the next step.

**Figure 38**




**1** Strain relief nut (outside the power supply)

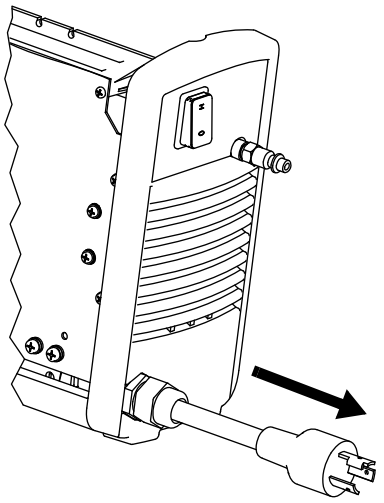
**2** Strain relief

**3** Rear panel

**4** Retention nut (inside the power supply)

6. From outside of the power supply, pull the wires through the strain relief and through the hole in the rear panel to remove the power cord.

7. Are you replacing the strain relief?
   - ❑ If yes, remove the strain relief from the rear panel.
   - ❑ If no, continue with *Install the power cord and strain relief* on page 103.



### CE and CCC power cords

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
   d. See *Detach the rear panel* on page 95.

CE and CCC power cords have a brown wire and a blue wire that connect to the power switch and a green/yellow ground wire that connects to the heatsink.

2. Remove the blue and brown wires from the power switch.
3. Remove the screw that holds the green/yellow ground wire to the heatsink. A notch in the power board provides access to the screw.

**Figure 39**

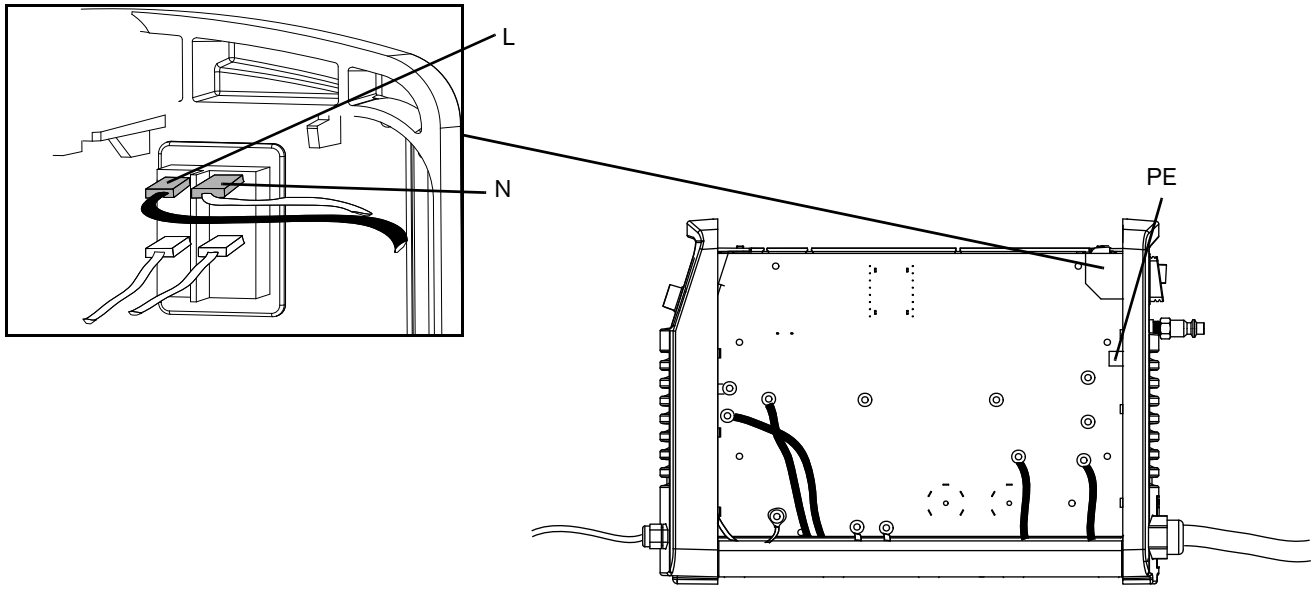


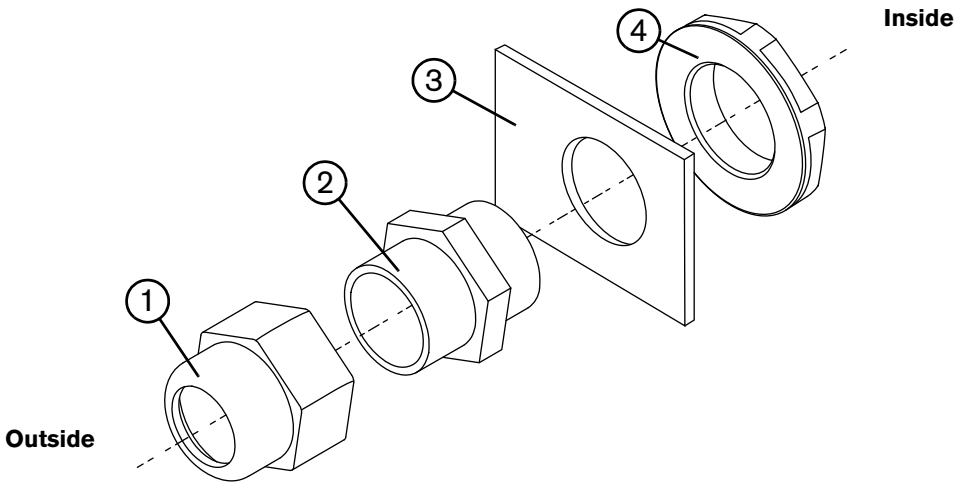

**Table 2 – Single-phase CE and CCC power cord wires**

| Designator | Wire color |
|---|---|
| L (live) | Brown |
| N (neutral) | Blue |
| PE (ground) | Green/yellow |

4. On the outside of the power supply, loosen the strain relief nut so that the wires move freely.

5. Are you replacing the strain relief?
   - ❑ If yes, use an adjustable wrench to unscrew the retention nut on the inside of the power supply.
   - ❑ If no, continue with the next step.

**Figure 40**

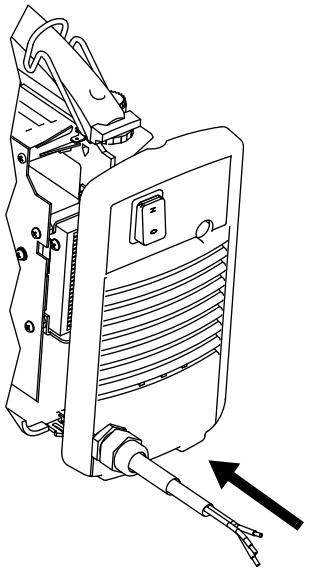



**1** Strain relief nut (outside the power supply)
**2** Strain relief
**3** Rear panel
**4** Retention nut (inside the power supply)

6. Remove the power plug from the old power cord.

7. From the inside of the power supply, pull the wires through the strain relief and the hole in the rear panel. (You cannot remove the wires from outside the power supply because of the ferrite core installed on the wires.)

8. Are you replacing the strain relief?
   - ❑ If yes, remove the strain relief from the rear panel.
   - ❑ If no, continue with *Install the power cord and strain relief* on page 103.



## Install the power cord and strain relief

### CSA power cords

1. Are you installing a new strain relief?
   - ❑ If yes, slide the strain relief nut and strain relief onto the new power cord, then route the wires for the new power cord through the hole in the rear panel.
   - ❑ If no, slide the strain relief nut over the new power cord, and route the wires through the strain relief.
2. On the inside of the rear panel, slide the retention nut over the power cord wires and screw it onto the strain relief.
3. Press the connector for the black wire onto the pin on the upper left side of the power switch.
4. Press the connector for the white wire onto the pin on the upper right side of the power switch.
5. Tighten the green ground wire to the heatsink with a torque setting of 17.3 kg-cm (15 inch-pounds).
6. Position the wires in the wire chase up the side of the rear panel and out of the way of the power board. At the same time realign the rear panel with the power supply. See *Reattach the rear panel* on page 97.
7. Tighten the strain relief nut on the outside of the rear panel.
8. Complete the following procedures:
   a. See *Install the component barrier* on page 91.
   b. See *Install the power supply cover* on page 89.
   c. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

### CE and CCC power cords

1. Are you installing a new strain relief?
   - ❑ If yes:
     - i. Slide the retention nut onto the new power cord.
     - ii. From the inside of the rear panel, route the power cord wires through the hole in the panel.
     - iii. On the outside of the rear panel, slide the strain relief and strain relief nut onto the power cord.
     - iv. On the inside of the rear panel, screw the retention nut onto the strain relief.
   - ❑ If no:
     - i. Route the wires for the new power cord through the strain relief from the inside of the rear panel.
     - ii. Slide the strain relief nut onto the new power cord on the outside of the rear panel.

   Because the power cord includes the ferrite core, you cannot route the power cord through the strain relief from the outside of the power supply. Do not remove the ferrite core from the power cord wires.

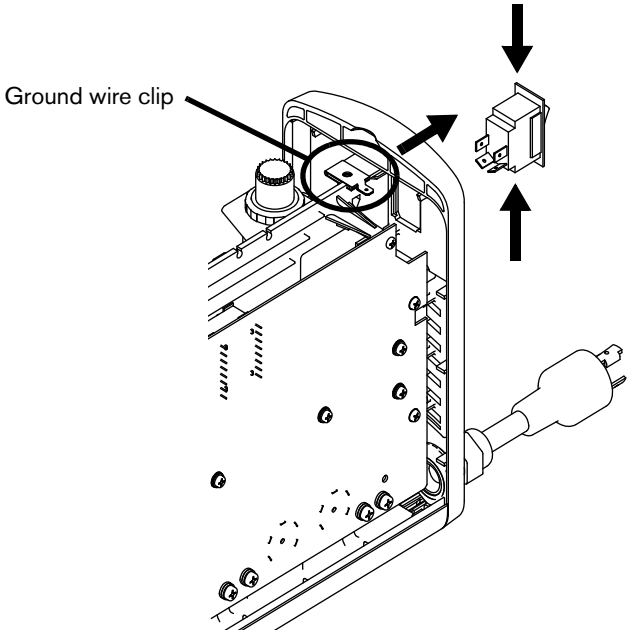
2. Press the connector for the brown wire onto the pin on the upper left side of the power switch.
3. Press the connector for the blue wire onto the pin on the upper right side of the power switch.
4. Tighten the green/yellow ground wire to the heatsink with a torque setting of 17.3 kg-cm (15 inch-pounds).
5. Position the wires in the wire chase up the side of the panel and out of the way of the power board. At the same time realign the rear panel with the power supply. See *Reattach the rear panel* on page 97.
6. Tighten the strain relief nut on the outside of the rear panel.
7. Complete the following procedures:
   - a. See *Install the component barrier* on page 91.
   - b. See *Install the power supply cover* on page 89.
   - c. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the power switch

| Kit number | Description |
|---|---|
| *428235* | *Kit: Power switch* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
2. Disconnect the ground wire from the ground wire clip near the top of the rear panel. See *Figure 41*.
3. Gently tilt the top of the rear panel away from the power supply, then disconnect the 4 wires from the back of the power switch.
4. Using a small blade screwdriver, press down one of the tabs on the top of the power switch, and push that corner of the switch out of the rear panel.
5. Press down the other tab on the top of the power switch, and push that corner of the switch out of the panel. Make sure the first tab does not snap back into place as you release the second tab.
6. Repeat the previous two steps on the bottom of the power switch to push the bottom of the switch out of the rear panel. Remove the switch completely from the panel.

**Figure 41**

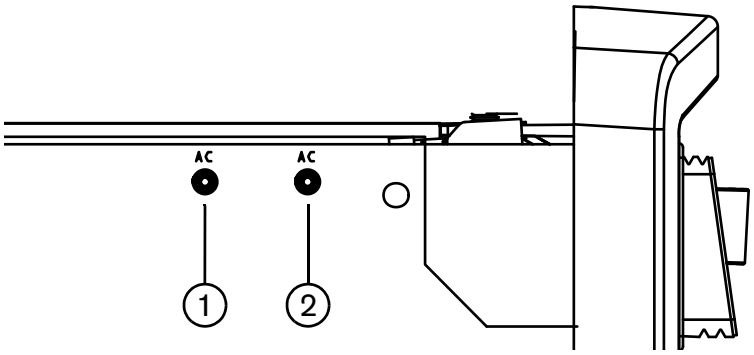


**7.** Press the new power switch into the new panel with the ON (**I**) label at the top of the switch.

You should hear the switch snap into place.

**8.** Push the connectors for the two white wires that are attached to the power board at "AC" onto the bottom two pins of the power switch. The left "AC" wire ① connects to the bottom-left pin on the power switch; the right "AC" wire ② connects to the bottom-right pin on the power switch. See *Figure 42* and *Figure 43*.

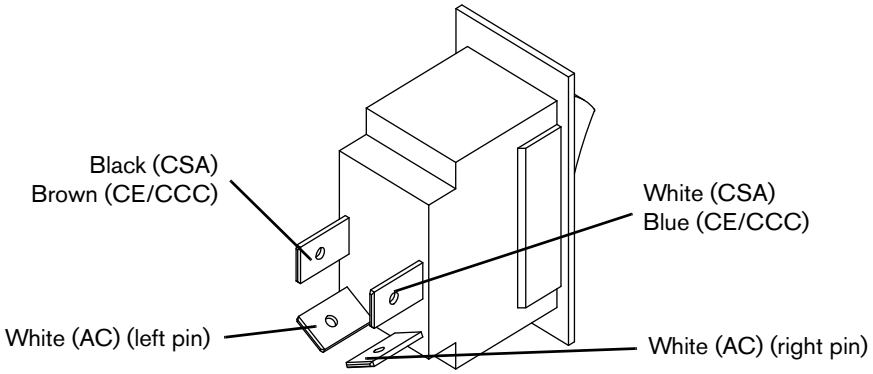
**Figure 42**




**9.** Press the connector for the black (CSA) or brown (CE/CCC) wire onto the pin on the upper left side of the power switch.

**10.** Press the connector for the white (CSA) or blue (CE/CCC) wire onto the pin on the upper right side of the power switch.

**Figure 43**




**11.** Reconnect the ground wire to the ground wire clip on the rear panel.

**12.** Complete the following procedures:

- **a.** See *Install the component barrier* on page 91.
- **b.** See *Install the power supply cover* on page 89.
- **c.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the control board

| Kit number | Description |
|---|---|
| *428232* | *Kit: Control board (141336)* |

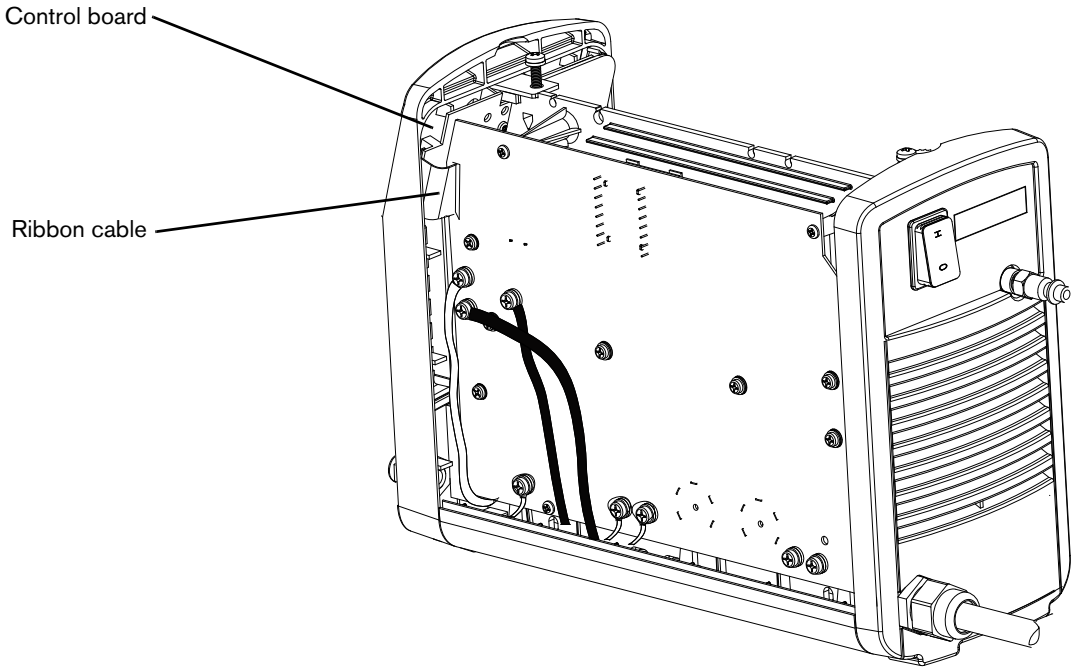
| | |
|---|---|
| | **CAUTION!** |
| | **Static electricity can damage circuit boards. Use proper precautions when handling printed circuit boards.**<br>**Store PC boards in anti-static containers.**<br>**Wear a grounded wrist strap when handling PC boards.** |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the component barrier* on page 90.
   c. See *Remove the power supply cover* on page 88.
   d. See *Detach the front panel* on page 92.
2. Verify the control board ribbon cable is disconnected from the power board. See *Figure 44*.

| | | |
|---|---|---|
| | | **WARNING!**<br>**ELECTRIC SHOCK CAN KILL** |
| | | **Stay clear of electrical wires and components while testing the new control board.** |

3. Test the new control board before installing it.
   a. Attach control board's ribbon cable to the power board.
   b. Reconnect the power cord to the power source, and turn the system ON.
   c. Verify that the Start LED on the control board is the only LED illuminated. Also, the fault LEDs on the front panel should be extinguished.

**Figure 44**

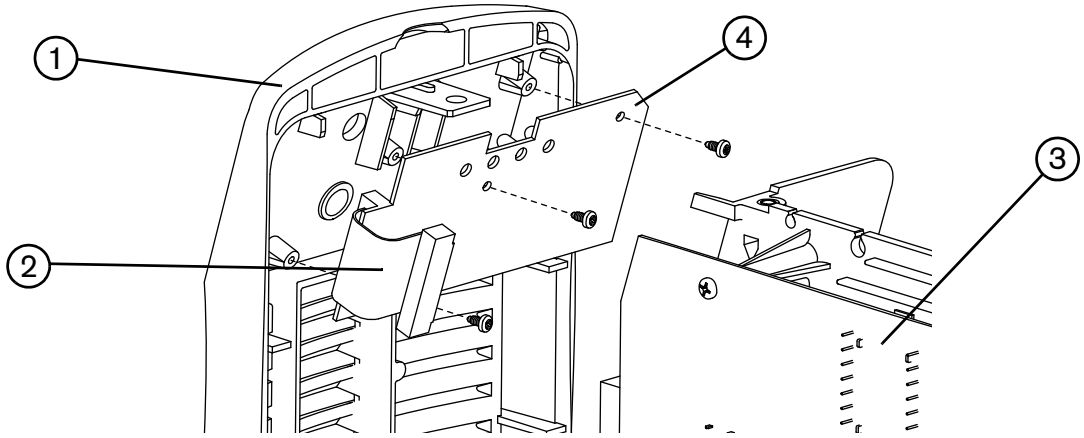



**4.** Disconnect the power cord from the power source, disconnect the ribbon cable, and set the new control board aside.

**5.** Remove the amperage adjustment knob from the front of the power supply by pulling it away from the panel. (It does not have a set screw.)

**6.** Remove the 3 retaining screws from the control board, and lift it out of the front panel.

**Figure 45**




**1** Front panel

**2** Ribbon cable

**3** Power board

**4** Control board

7. Slide the new control board into place, and attach it to the front panel with the three retaining screws.
8. Connect the ribbon cable to the power board, and fold the latches up to hold it in place.
9. Press the amperage adjustment knob onto the post on the front panel of the power supply.
10. Complete the following procedures:
    a. See *Reattach the front panel* on page 94.
    b. See *Install the component barrier* on page 91.
    c. See *Install the power supply cover* on page 89.
    d. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the power board

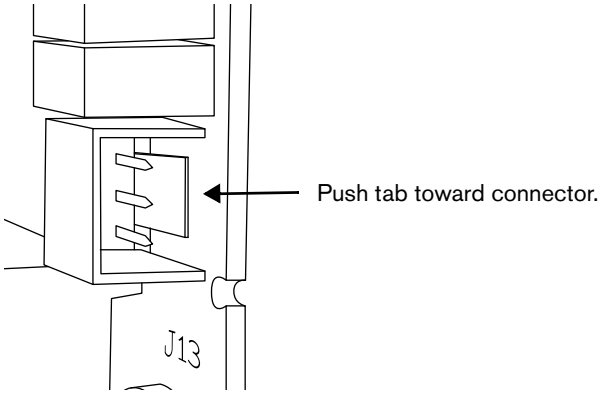
| Kit number | Description |
|---|---|
| *428233* | *Kit: Power board, CSA (141304)* |
| *428234* | *Kit: Power board, CE and CCC (141309)* |

Although there are some technical differences between the power board for CSA power supplies and the power board for CE/CCC power supplies, the procedure to replace the boards is the same.

### Remove the power board

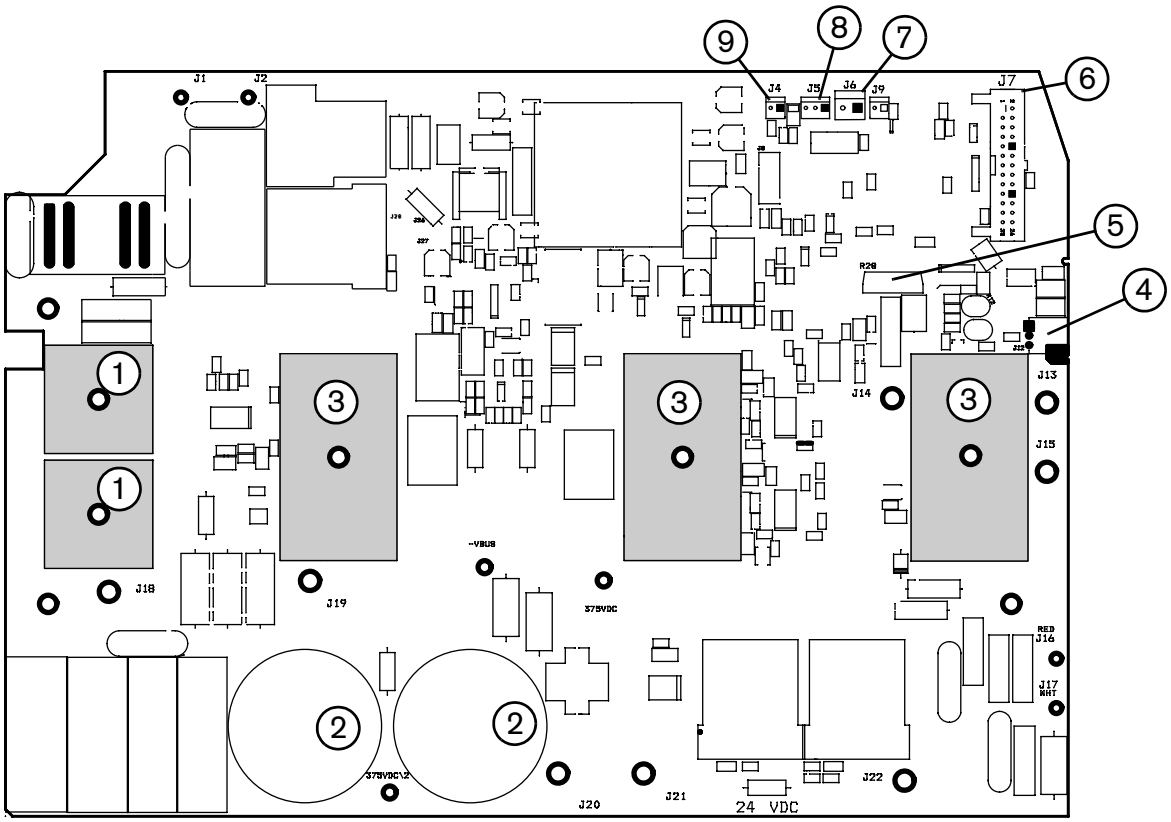
1. Complete the following procedures:
    a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
    b. See *Remove the power supply cover* on page 88.
    c. See *Remove the component barrier* on page 90.
    d. See *Detach the front panel* on page 92.
2. Remove the TORCH START connector (J12) on the component side of the power board (see *Figure 47* on page 110) by pushing the tab on the connector toward the plug and pulling the plug out.

**Figure 46**



**3.** Remove the connectors at J4, J5, and J6 on the component side of the power board. (See *Figure 47*.)

**Figure 47**




**1** Input diode bridges

**2** Capacitors

**3** IGBTs

**4** Connector TORCH START (J12)

**5** Snubber resistor

**6** Ribbon cable connector (J7)

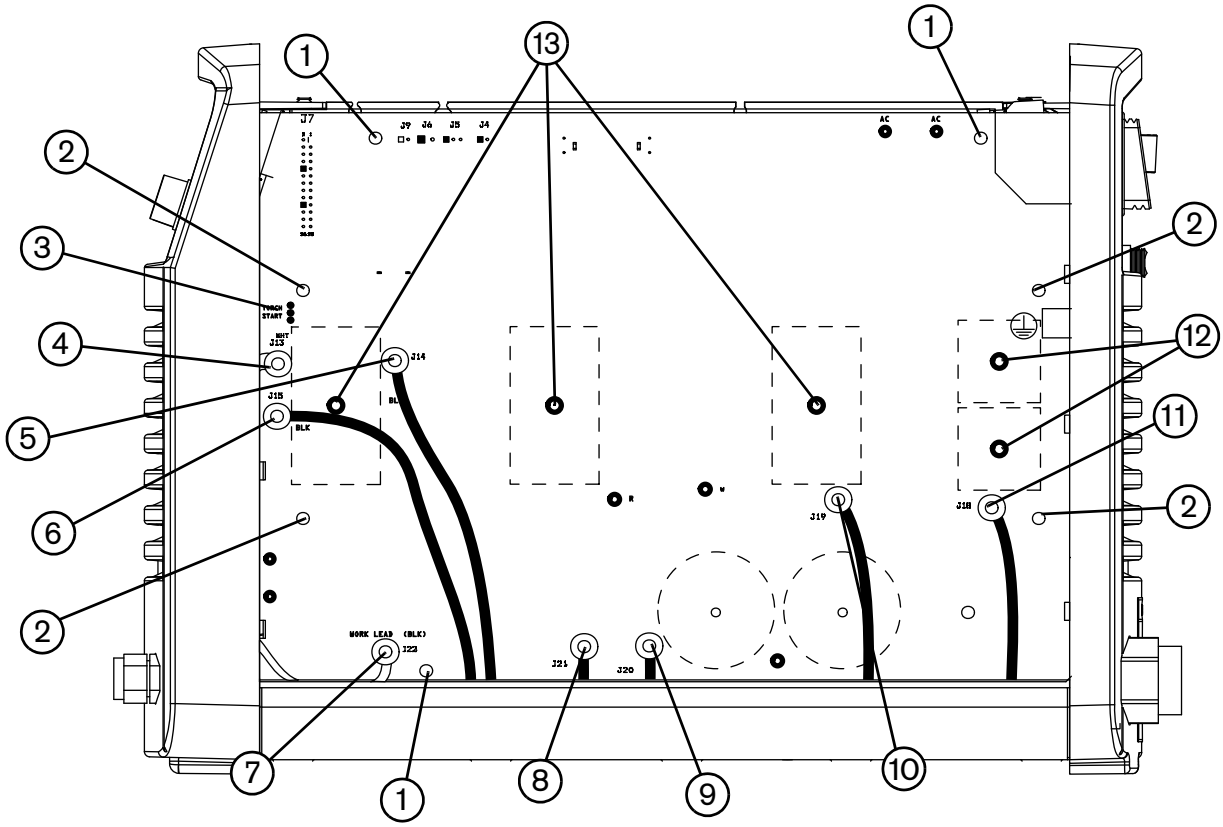
**7** J6

**8** J5

**9** J4

4. On the back of the power board, remove the wire connectors for the transformers and inductors. (See *Figure 48*.)
   a. Remove J13, J14, and J15, located on the front panel end of the power board.
   b. Remove J18 and J19, located on the rear panel end of the power board.
   c. Remove J20 and J21, located on the bottom center of the power board.
5. Remove the work lead ring terminal from J22.
6. Remove the 3 retaining screws and the 4 heatsink assembly screws.
7. Remove the 3 screws that attach the IGBTs to the heatsink and the 2 screws that attach the input diode bridges to the heatsink. Holes in the power board provide access to the 2 input diode bridge screws.

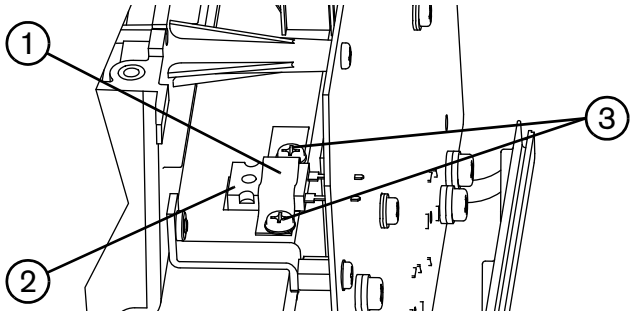
**Figure 48**




1 Retaining screws (3)
2 Heatsink assembly screws (4)
3 Connector TORCH START (J12)
4 J13
5 J14
6 J15
7 Work lead connector (J22)
8 J21
9 J20
10 J19
11 J18
12 Input diode bridge screws (2)
13 IGBT screws (3)

**8.** Remove the 2 screws from the snubber resistor spring clip on the top of the heatsink, and remove the spring clip.

**Figure 49**




**1** Spring clip

**2** Snubber resistor

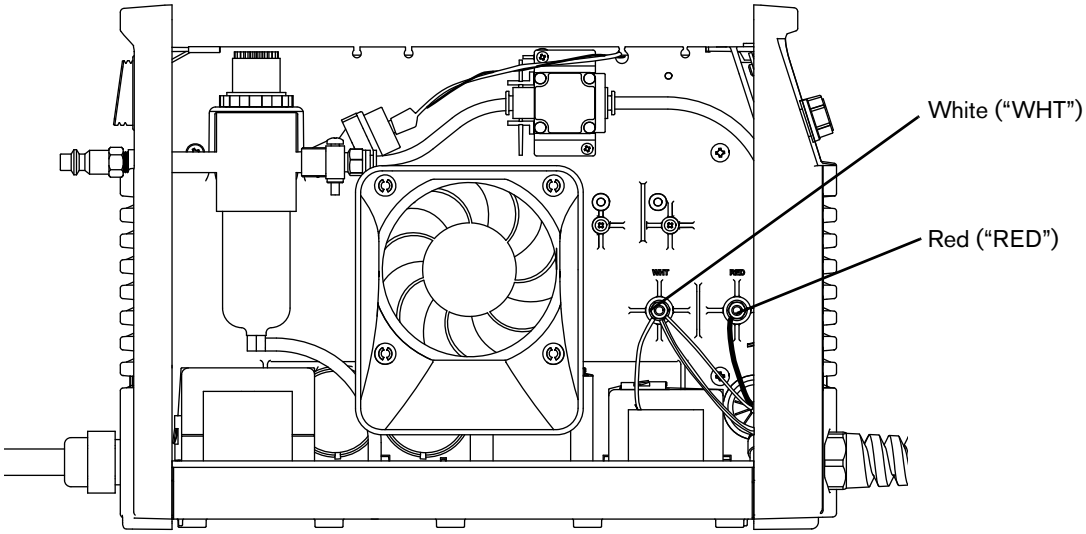
**3** Snubber resistor screws

**9.** Disconnect the bottom two wires (both are white) from the power switch.

**10.** Use an 8 mm (5/16-inch) nut driver to remove the nuts that attach the red and the white wires to the studs on the fan side of the power supply. The studs are labeled “RED” and “WHT.”

**11.** Pull the red and white wires through the hole in the center panel of the power supply.

**Figure 50**




**12.** From the power board side of the power supply, push the wires that you disconnected down and out of the way.

**13.** Pull the board straight out from the power supply and set it aside.

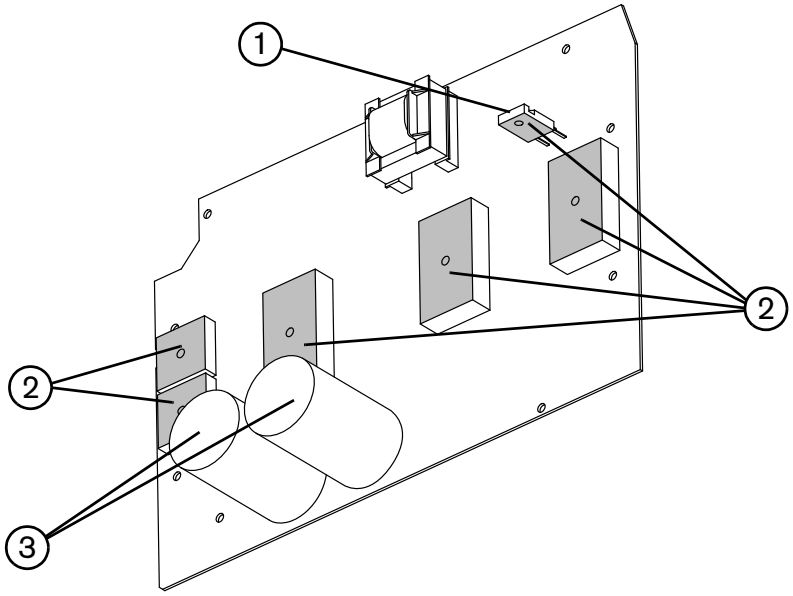
## Install the power board

Before beginning this procedure, verify you have the correct power board for your system.

- The replacement kit number for a CSA power board is 428233.
- The replacement kit number for a CE/CCC power board is 428234.

1. Being careful not to scratch the heatsink, use a clean cloth with isopropyl alcohol to remove any residual thermal grease.
2. Apply a 0.051 mm (0.002 inch) layer of thermal grease, about the thickness of a sheet of paper, on all the IGBTs and the input diode bridges.
3. Apply thermal grease to the bottom of the snubber resistor as follows.
   a. Avoid getting any thermal grease on the prongs of the snubber resistor.
   b. Start from the end closest to the power board and drag away from the prongs.
   c. Spread an even layer of thermal grease 0.051 mm (0.002 inch) thick on the bottom of the snubber resistor. (See *Figure 51*.)

**Figure 51**




**1** Snubber resistor

**2** Thermal grease

**3** Capacitors

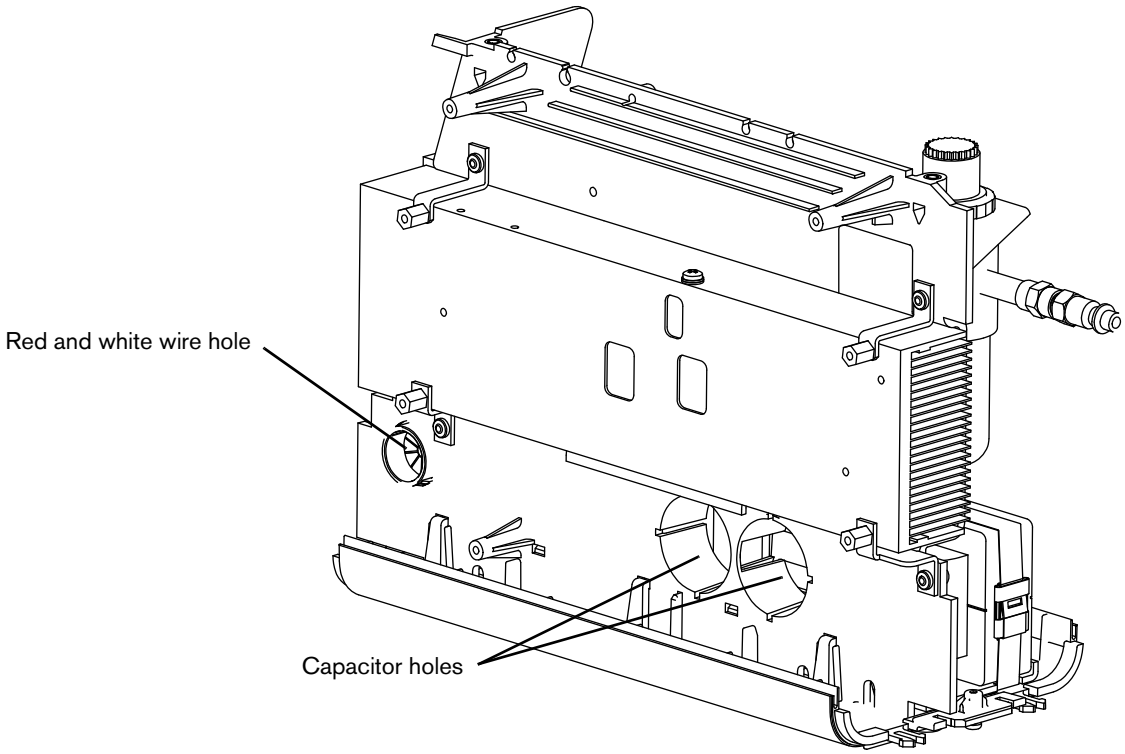
4. Push the red and white wires on the new power board through the hole in the center panel from the power board side of the power supply to the fan side of the power supply.

5. Push the wires that you disconnected down and out of the way.

6. Line up the capacitors on the power board with the holes in the power supply's center panel. (See *Figure 51* and *Figure 52*.)

7. Push the power board straight in.

**Figure 52**




8. Reconnect the 2 white wires to the power switch.

9. Replace the 4 heatsink assembly screws and the 3 retaining screws. Tighten these screws to 17.3 kg-cm (15 inch-pounds).

10. Replace the 3 screws that attach the IGBTs to the heatsink and the 2 screws that attach the input diode bridges to the heatsink. Tighten these screws to 17.3 kg-cm (15 inch-pounds).

**11.** Replace the 2 screws and the spring clip that you removed from the snubber resistor. Tighten the screws to 17.3 kg-cm (15 inch-pounds). See *Figure 49* on page 112.

**CAUTION!**

**A torque setting higher than 17.3 kg-cm (15 inch-pounds) can damage the resistor.**

**12.** On the power board side of the power supply, reconnect the wires to the transformers and inductors at J13, J14, J15, J18, J19, J20, J21, and the work lead ring terminal at J22. Tighten the screws to 23.0 kg-cm (20 inch-pounds).

**13.** On the component side of the power board, reconnect the connector TORCH START (J12) and the connectors at J4, J5, and J6.

**14.** Reconnect the ribbon cable from the control board to the power board (J7).

**15.** On the fan side of the power supply, reconnect the ring connectors for the red and white wires to the studs labeled "RED" and "WHT," and reinstall the nuts.

If you removed any other wires from the WHT and RED studs, reinstall them on the studs as well.

**16.** Complete the following procedures:

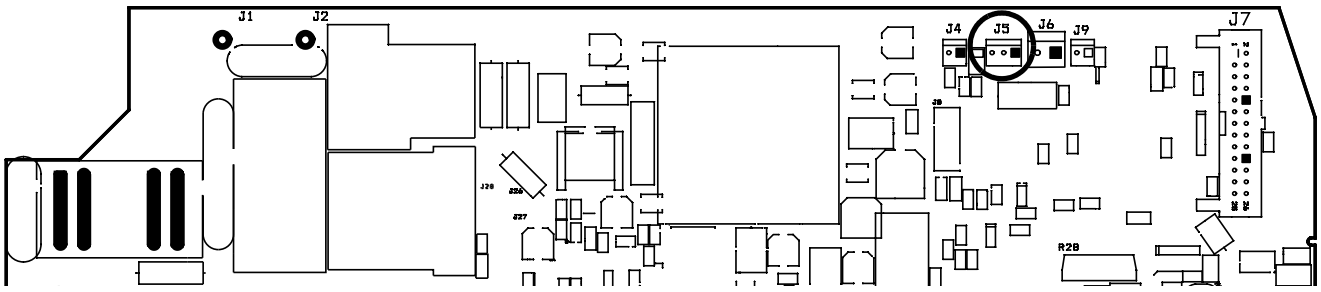
- **a.** See *Reattach the front panel* on page 94.
- **b.** See *Install the component barrier* on page 91.
- **c.** See *Install the power supply cover* on page 89.
- **d.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the fan

| Kit number | Description |
|---|---|
| *428236* | *Kit: Fan assembly with plenum* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Detach the connector from J5 on the power board. (See *Figure 53*.) You may have to lift the top edge of the component barrier to see the connector.

**Figure 53**



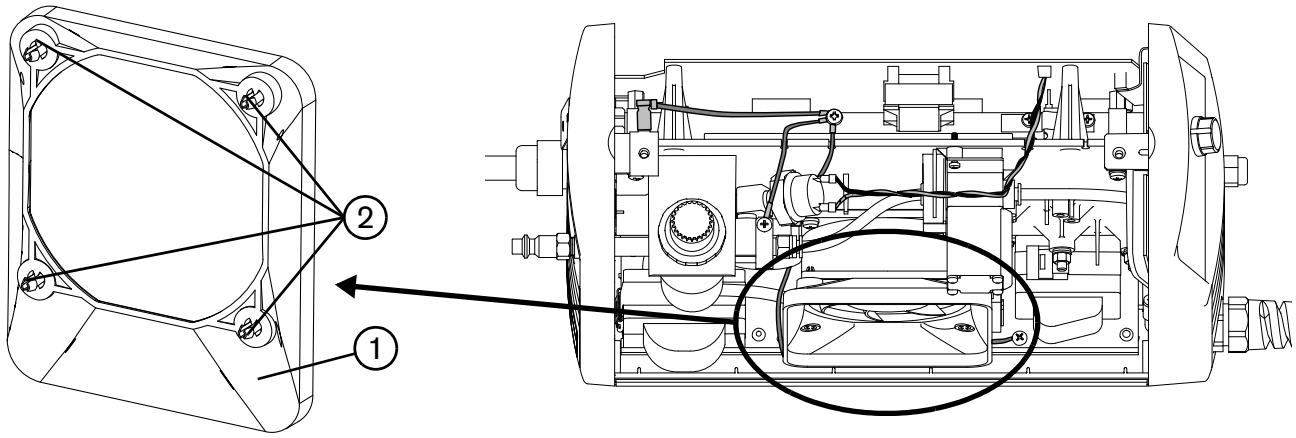

3. Carefully pull the fan plenum ① straight off the fan casing to release the 4 clips ② at each corner of the plenum. See *Figure 54*.

If necessary, use needle nose pliers to compress and release the plenum's top 2 corner clips first before working the bottom two clips free from the fan casing.

**CAUTION!**

**Be careful not to apply too much pressure to any of the clips as you detach the plenum from the fan.**

**Figure 54**




4. Remove the retaining screw from each corner of the fan.

5. Slide the old fan out of the power supply and set it aside.

6. Slide the new fan into place. Orient the fan so that the red-and-black wires are at the upper left corner of the fan (the side closest to the rear panel).

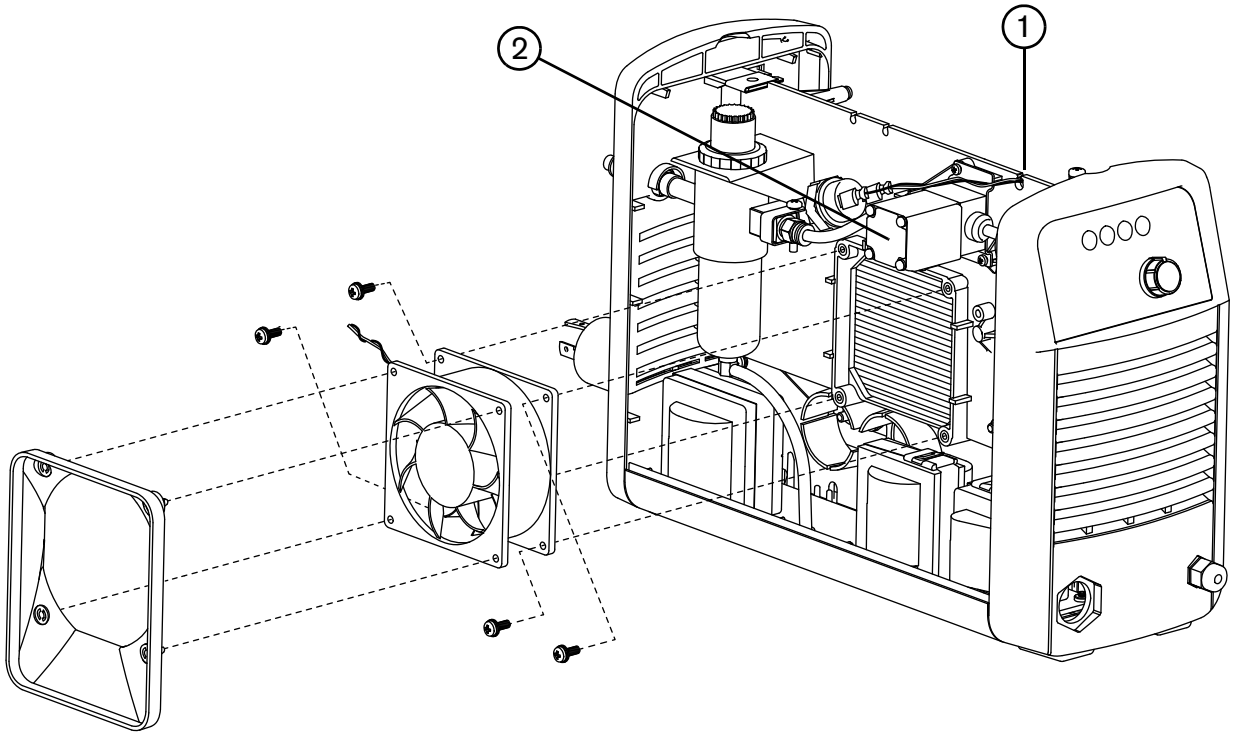
7. Reinstall the four retaining screws and tighten them to 11.5 kg-cm (10 inch-pounds). Use the new screws included in the kit if needed (075711).

8. Orient the new fan plenum so that the wider end is at the bottom, and snap it into place. (See *Figure 55*.)

9. Route the fan's red-and-black wires through the notch in the top of the center panel that is nearest the solenoid valve. (See *Figure 55*.)

10. Attach the connector for the red-and-black wires to J5 on the power board. (See *Figure 53* on page 116.)

**Figure 55**




**1** Route the fan's red-and-black wires through this notch in the center panel

**2** Solenoid valve

**11.** Complete the following procedures:

**a.** See *Install the power supply cover* on page 89.

**b.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the drain hose, gas supply hoses, and 90° fitting

| Kit number | Description |
|---|---|
| *228095* | *Kit: Hoses: drain hose, two gas supply hoses, elbow fitting* |

The Powermax30 XP contains a drain hose and two gas supply hoses that can be replaced. (See *Figure 57*.)

- The drain hose runs from the bottom of the air filter bowl to the base of the power supply.
- One gas supply hose runs from the air filter/regulator to the solenoid valve.
- The other gas supply hose runs from the solenoid valve to the torch lead.

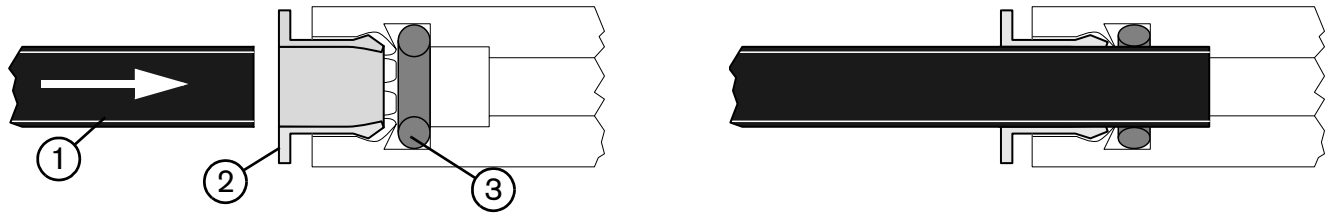
You can also replace the plastic 90° fitting that connects the gas supply hose from the solenoid valve to the gas supply fitting from the torch lead.

The gas supply hoses in this system use push-to-connect fittings.

**Figure 56 – How to use push-to-connect fittings**

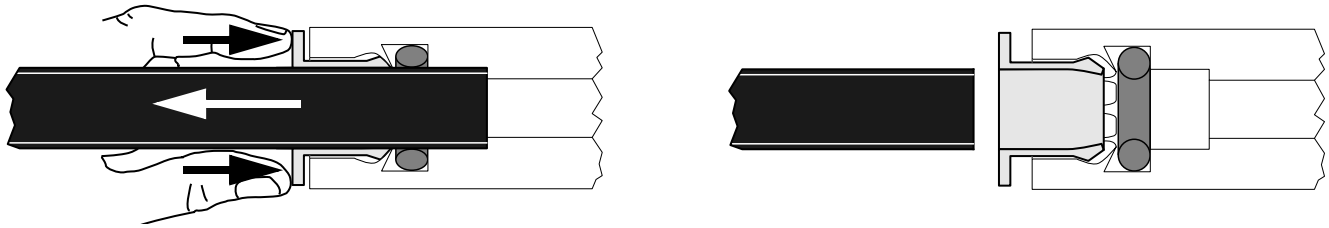
**Push-to-Connect**

- To connect, push the hose into the fitting until it stops. Pull on the hose to verify that it is secure.




| | | |
|---|---|---|
| 1 **Hose** | 2 **Collet** | 3 **O-ring** |

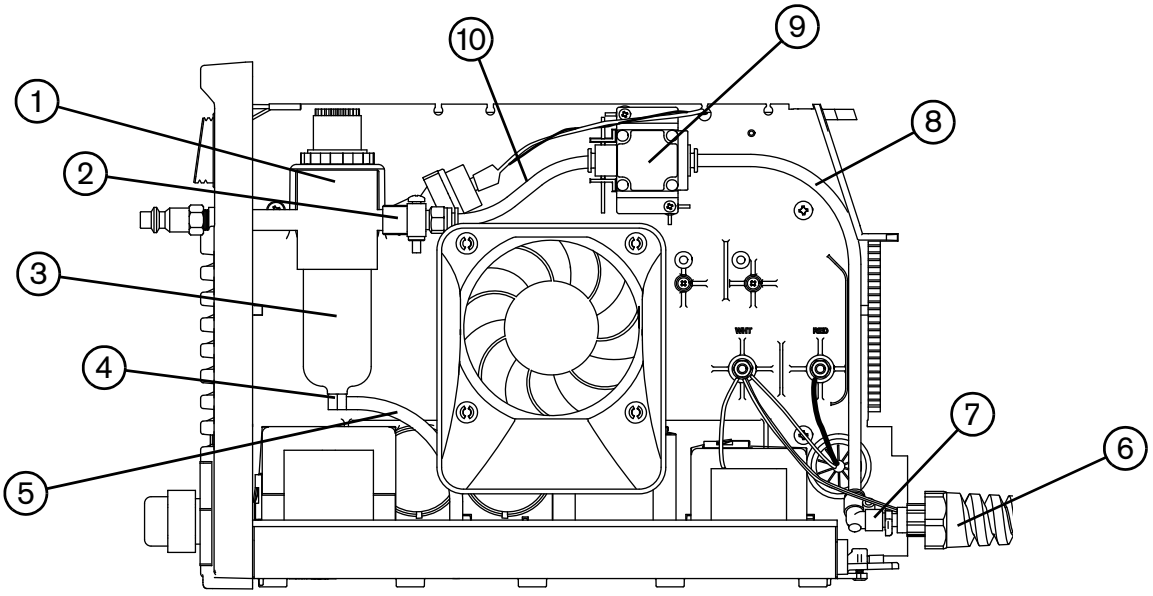
- To release, push the fitting collet toward the fitting, and pull the hose away from the fitting.



## Remove the drain hose, gas supply hoses, and 90° fitting

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Remove one end of the drain hose from the hole in the base of the power supply.
3. Remove the other end of the drain hose from the fitting on the bottom of the air filter bowl.
4. Remove the gas-supply hose that connects to the air filter/regulator and the solenoid valve:
   a. Push-to-disconnect the gas supply hose from the air filter/regulator's brass "T" fitting. (See *Figure 56* on page 119.)
   b. Push-to-disconnect the gas supply hose from the fitting on the rear-panel side of the solenoid valve.
5. Remove the gas supply hose and the plastic 90° fitting that connect the solenoid valve to the torch lead:
   a. Push-to-disconnect the gas supply hose from the fitting on the front-panel side of the solenoid valve.
   b. Push-to-disconnect the plastic 90° fitting from the torch lead's brass gas supply fitting inside the front panel of the power supply.
   c. Push-to-disconnect the gas supply hose from the top of the plastic 90° fitting.

**Figure 57**




**1** Air filter/regulator

**2** Brass “T” fitting

**3** Air filter bowl

**4** Fitting

**5** Drain hose

**6** Torch lead

**7** Plastic 90° fitting for torch lead

**8** Gas supply hose from solenoid valve to torch lead

**9** Solenoid valve

**10** Gas supply hose from air filter/regulator to solenoid valve

## Install the drain hose, gas supply hoses, and 90° fitting

Be careful not to kink any of the hoses as you install them.

1. Push one end of the new drain hose onto the fitting on the bottom of the air filter bowl. See *Figure 57* on page 121.
2. Insert the other end of the drain hose into the hole in the base of the power supply.
3. Install the new gas supply hose that connects to the air filter/regulator and the solenoid valve:
   a. Push-to-connect one end of the new hose into the air filter/regulator's brass "T" fitting. (See *Figure 56* on page 119.)
   b. Push-to-connect the other end of the new hose into the fitting on the rear-panel side of the solenoid valve.

   This kit contains 1 extra gas supply hose not used in the Powermax30 XP system.
4. Install the new gas supply hose and the plastic 90° fitting that connect the solenoid valve to the torch lead:
   a. Push-to-connect one end of the new hose into the fitting on the front-panel side of the solenoid valve.
   b. Push-to-connect the other end of the new hose into the top of the plastic 90° fitting for the torch lead.
   c. Push-to-connect the plastic 90° fitting onto the torch lead's brass gas supply fitting inside the front panel of the power supply.
5. Reconnect the gas supply, and check for leaks at each fitting and hose connection point on the air filter/regulator assembly.

**CAUTION!**

**Gas supply pressures not within the specifications in the *Specifications* section can cause poor cut quality, poor consumable life, and operational problems.**

**If the purity level of the gas is too low, or if there are leaks in the supply hoses or connections:**

- **Cut speeds can decrease.**
- **Cut quality can deteriorate.**
- **Cutting thickness capability can decrease.**
- **Consumables life can be shortened.**

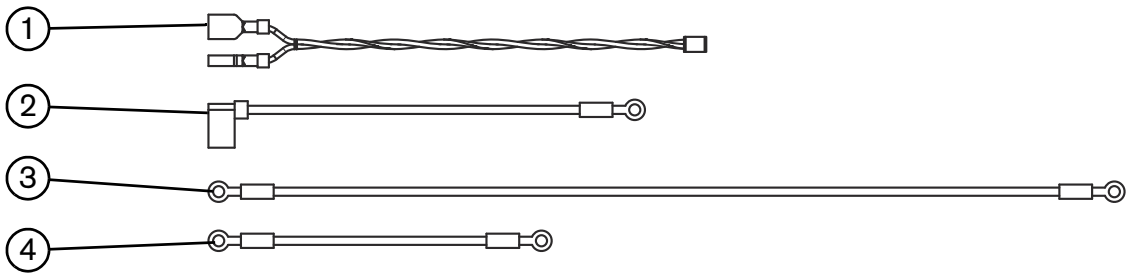
6. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the wire group

| Kit number | Description |
|---|---|
| *228103* | *Kit: Wire group: pressure switch wire pair, 3 ground wires* |

The wire group kit for the Powermax30 XP includes the following 4 wires:

**Figure 58**




**1** Pressure switch to J4 wire pair (red/black)

**2** Ground clip wire from heatsink to rear panel (green)

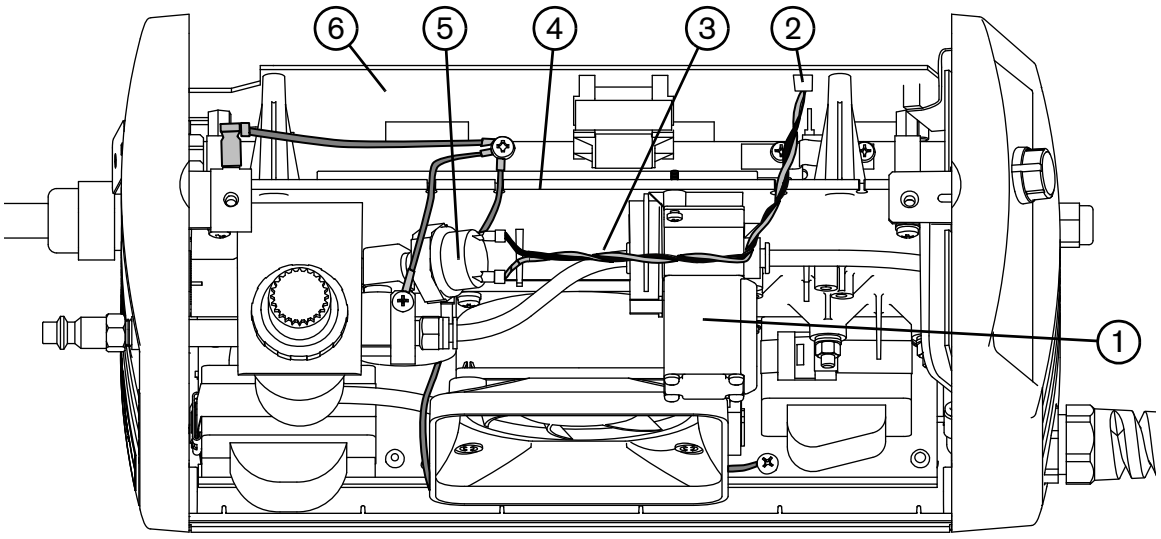
**3** Ground wire from heatsink to magnetics assembly (green)

**4** Ground wire from heatsink to air filter/regulator ground clip (green)

## Remove and install the pressure switch to J4 wires

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Remove the red-and-black wires from the pressure switch.
3. The other end of the red-and-black wire pair is connected to the power board at J4. (See *Figure 59*.) Lift the top edge of the component barrier and disconnect the wire pair by pulling the connector straight back away from the board.
4. Connect the new wire to the power board at J4, and route the wires through the notch in the center panel that is nearest the solenoid valve. (See *Figure 59*.)
5. Press the black wire's connector onto the pressure switch pin that is nearest the center panel.
6. Press the red wire's connector onto the pressure switch pin that is farthest from the center panel.
7. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 59**




1 Solenoid valve
2 J4 connector on the power board
3 Pressure switch to J4 wire pair
4 Center panel
5 Pressure switch
6 Power board

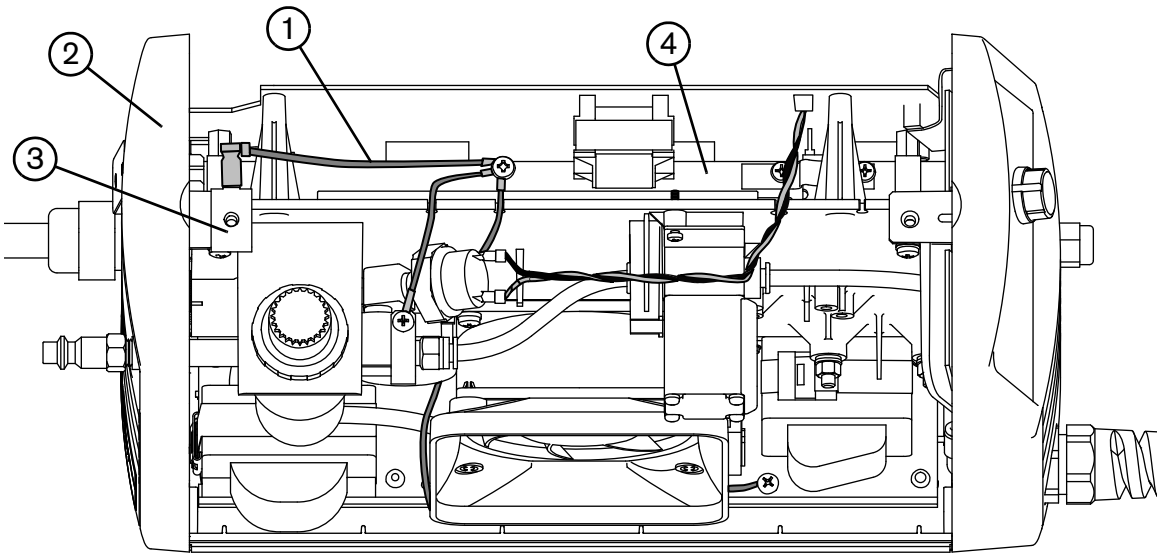
## Remove and install the ground clip wire from the heatsink to the rear panel

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Detach the connector from the ground clip on the rear panel. (See *Figure 60*.)
3. Remove the ground wire's ring terminal from the screw that attaches it to the heatsink.
4. Tighten the new ground wire's ring terminal to the heatsink to a torque setting of 23.0 kg-cm (20 inch-pounds).

   Be sure to reattach the ring terminals for the other two ground wires that connect to the heatsink using the same screw.

5. Press the connector on the other end of the wire onto the rear panel's ground clip. (See *Figure 60*.)
6. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 60**




**1** Ground clip wire from heatsink to rear panel
**2** Rear panel
**3** Rear panel ground clip
**4** Heatsink

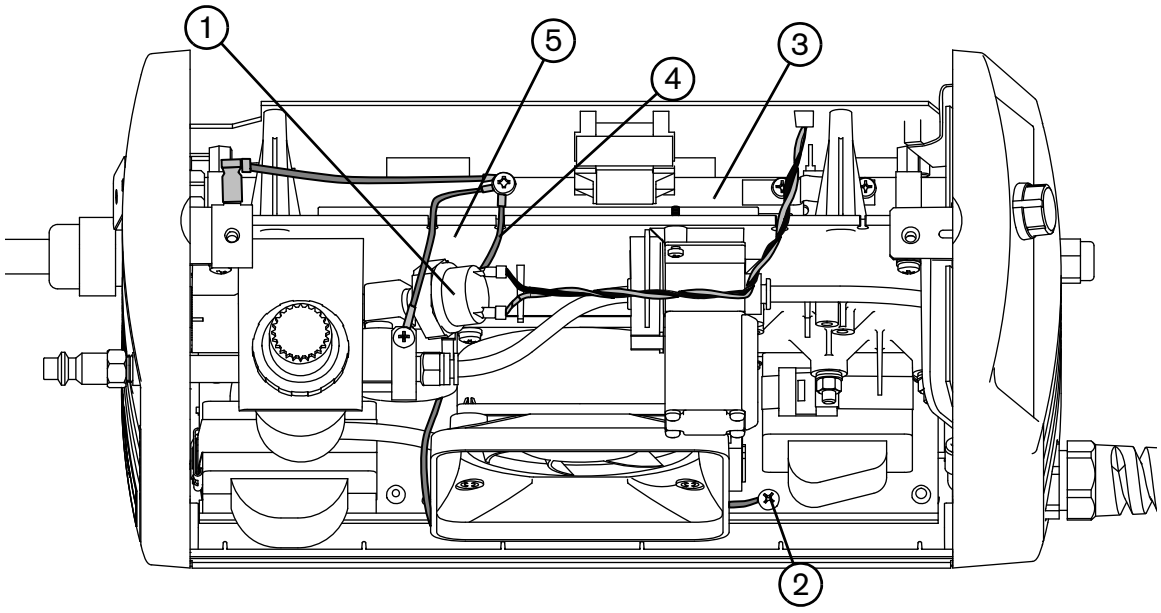
## Remove and install the ground wire from the heatsink to the magnetics assembly

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Remove the ground wire's ring terminal from the screw that attaches it to the heatsink.
3. The ring terminal on the other end of the wire is attached to the metal base plate of the magnetics assembly. (See *Figure 61*.) The connection point is just below the bottom right corner of the fan. The wire is routed behind the pressure switch and down along the left side of the fan housing. Remove the ring terminal from the screw that attaches it to the metal base plate.
4. Tighten the new ground wire's ring terminal to the heatsink to a torque setting of 23.0 kg-cm (20 inch-pounds).

   Be sure to reattach the ring terminals for the other two ground wires that connect to the heatsink using the same screw.

5. Route the new ground wire through the notch in the center panel above the pressure switch, behind the pressure switch, along the left side of the fan, and then along the metal base plate of the magnetics assembly to the screw below the bottom right corner of the fan. (See *Figure 61*.)
6. Use the screw to attach the ring terminal for the new wire to the metal base plate of the magnetics assembly with a torque setting of 17.3 kg-cm (15 inch-pounds).
7. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 61**




**1** Pressure switch

**2** Screw on the metal base plate of the magnetics assembly that attaches the ground wire

**3** Heatsink

**4** Ground wire from heatsink to magnetics assembly

**5** Center panel

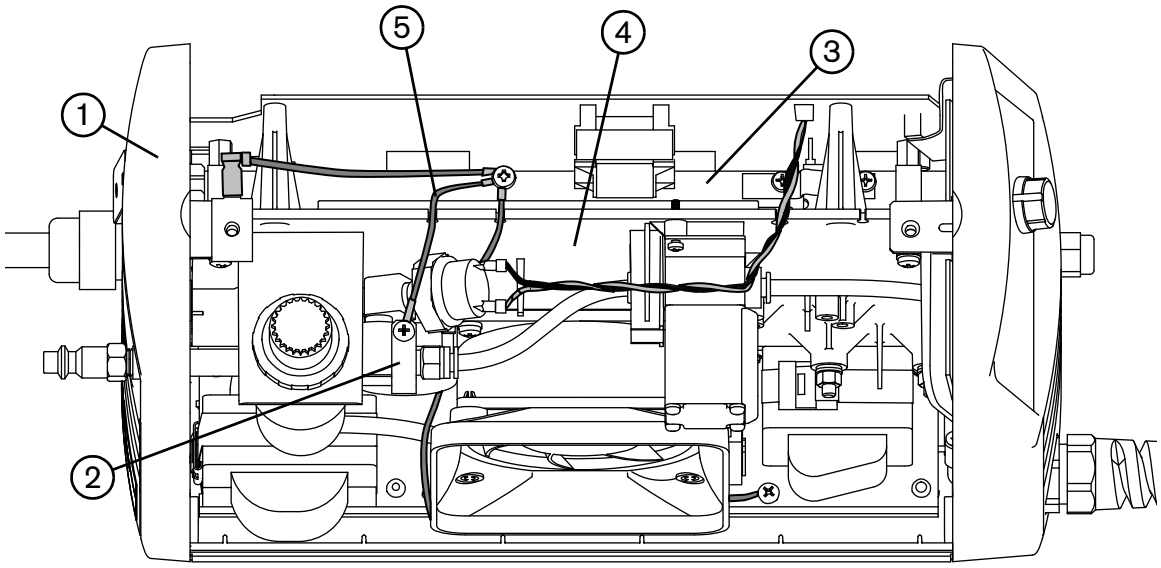
## Remove and install the ground wire from the heatsink to the air filter/regulator ground clip

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Remove the ground wire's ring terminal from the screw that attaches it to the heatsink.
3. The ring terminal on the other end of the wire is attached to the ground clip on the air filter/regulator's brass "T" fitting. (See *Figure 62*.) Unscrew the old ground wire from the ground clip.
4. Attach the new ground wire's ring terminal to the heatsink with a torque setting of 23.0 kg-cm (20 inch-pounds).

   Be sure to reattach the ring terminals for the other two ground wires that connect to the heatsink using the same screw.

5. Route the new ground wire through the notch in the center panel that is nearest the rear panel.
6. Use the screw to attach the wire to the air filter/regulator ground clip with a torque setting of 11.5 kg-cm (10 inch-pounds). (See *Figure 62*.)
7. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 62**




**1** Rear panel

**2** Ground clip on air filter/regulator's brass "T" fitting

**3** Heatsink

**4** Center panel

**5** Ground wire from heatsink to air filter/regulator ground clip

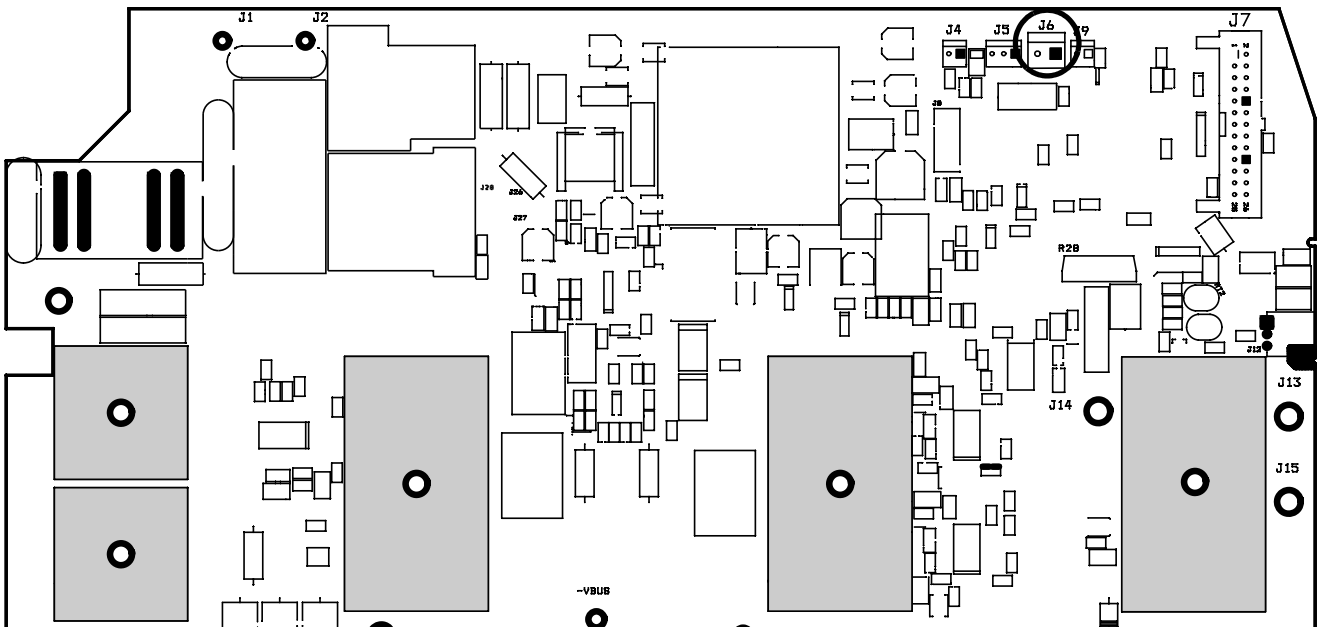
## Replacing the solenoid valve

| Kit number | Description |
|---|---|
| *428173* | *Kit: Solenoid valve* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Detach the connector from J6 on the power board by pulling it straight back away from the board. (See *Figure 63*.)

If needed, lift the top edge of the component barrier that protects the power board to better access the J6 connector.

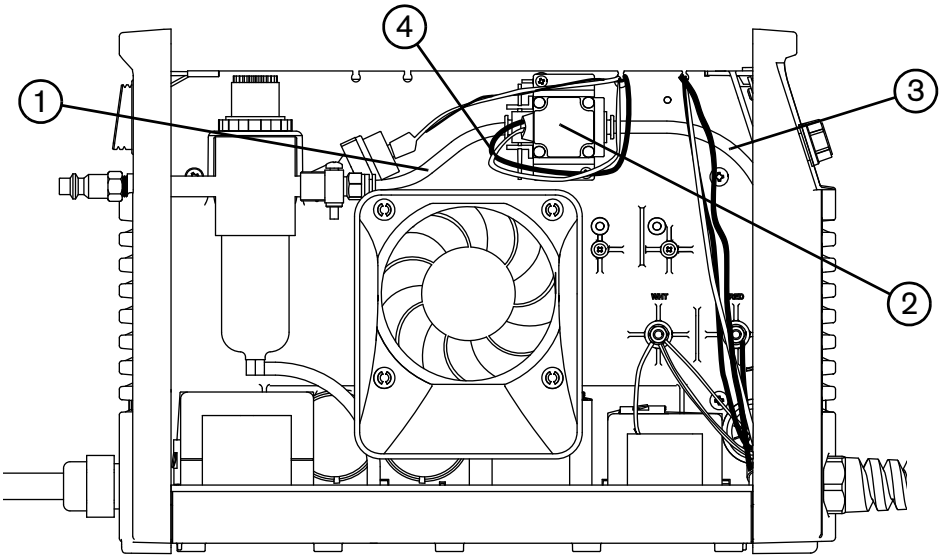
**Figure 63**



3. Push-to-disconnect the gas supply hose from the fitting on the rear-panel side of the solenoid valve. (See *Figure 56* on page 119.)

4. Push-to-disconnect the gas supply hose from the fitting on the front-panel side of the solenoid valve.

**Figure 64**




**1** Gas supply hose (rear-panel side)

**2** Solenoid valve

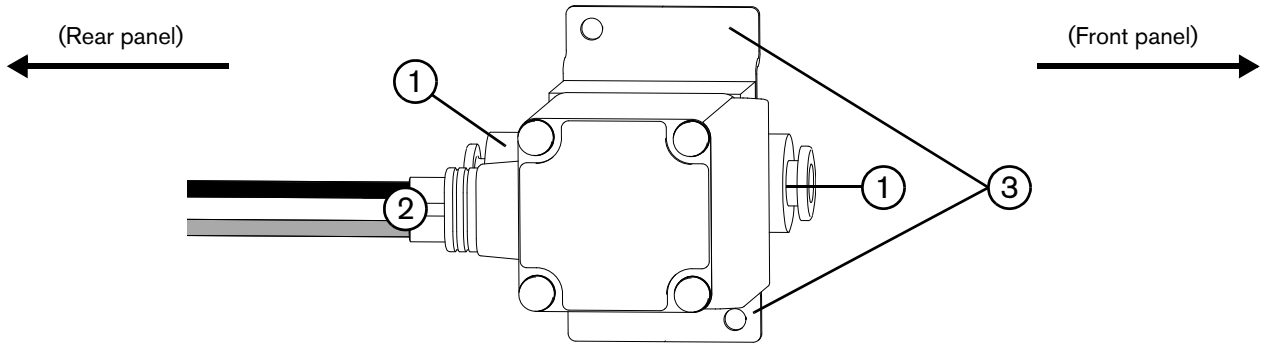
**3** Gas supply hose (front-panel side)

**4** J6 wire pair

5. Remove the 2 screws that attach the solenoid valve's bracket to the center panel.

6. Orient the new solenoid valve so that the pink-and-gray J6 wire pair is on the rear-panel side of the valve.

**Figure 65**




**1** Push-to-connect fitting

**2** Pink-and-gray J6 wire pair

**3** Solenoid valve bracket

7. Line up the holes in the valve's bracket with the holes in the center panel and attach it to the center panel using the 2 screws with a torque setting of 11.5 kg-cm (10 inch-pounds).

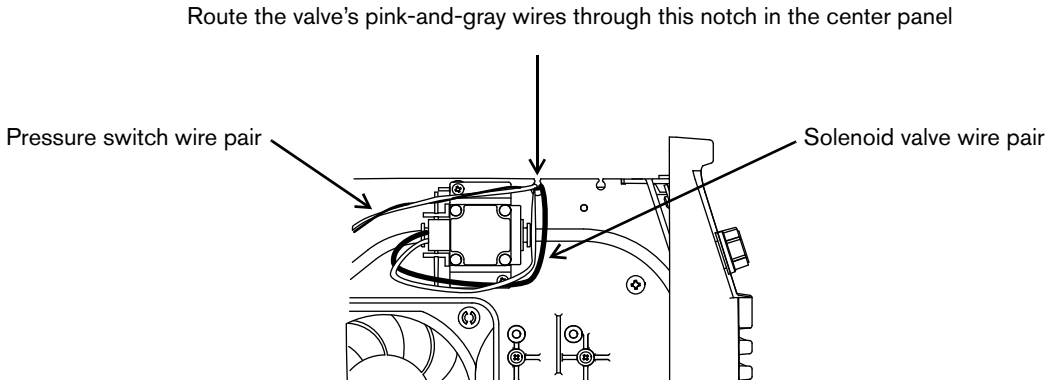
8. Push-to-connect the gas supply hose you removed in step 3 on page 131 into the fitting on the rear-panel side of the solenoid valve. (See *Figure 56* on page 119.)

Be careful not to kink the hoses as you reconnect them.

9. Push-to-connect the gas supply hose you removed in step 4 on page 131 into the fitting on the front-panel side of the solenoid valve.

10. Connect the valve's pink-and-gray wire pair to the power board at J6. (See *Figure 63* on page 130.) Route the wires through the notch in the center panel that is nearest the solenoid valve.

**Figure 66**


Route the valve's pink-and-gray wires through this notch in the center panel
Pressure switch wire pair
Solenoid valve wire pair

11. Reconnect the gas supply, and check for leaks at each fitting and hose connection point on the air filter/regulator assembly.

**CAUTION!**

**Gas supply pressures not within the specifications in the *Specifications* section can cause poor cut quality, poor consumable life, and operational problems.**

**If the purity level of the gas is too low, or if there are leaks in the supply hoses or connections:**

- **Cut speeds can decrease.**
- **Cut quality can deteriorate.**
- **Cutting thickness capability can decrease.**
- **Consumables life can be shortened.**

12. Complete the following procedures:

    a. See *Install the power supply cover* on page 89.

    b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

# Replacing the torch lead and strain relief

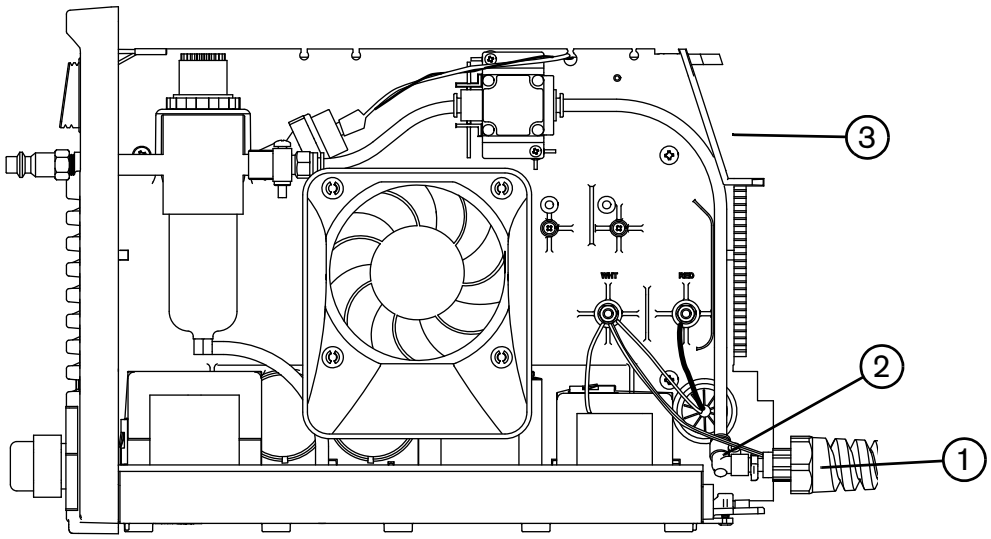
| Kit number | Description |
|---|---|
| *428176* | *Kit: Duramax LT torch lead, 4.6 m (15 feet), with strain relief* |

## Remove the torch lead and strain relief

If you are replacing just the torch lead cable, not the whole torch assembly, refer to *Replacing the torch lead* on page 182 for details on how to remove the old lead from the torch.

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Detach the front panel* on page 92.
2. Push-to-disconnect the plastic 90° fitting from the torch lead's brass gas supply fitting inside the front panel of the power supply. (See *Figure 56* on page 119.)

**Figure 67**



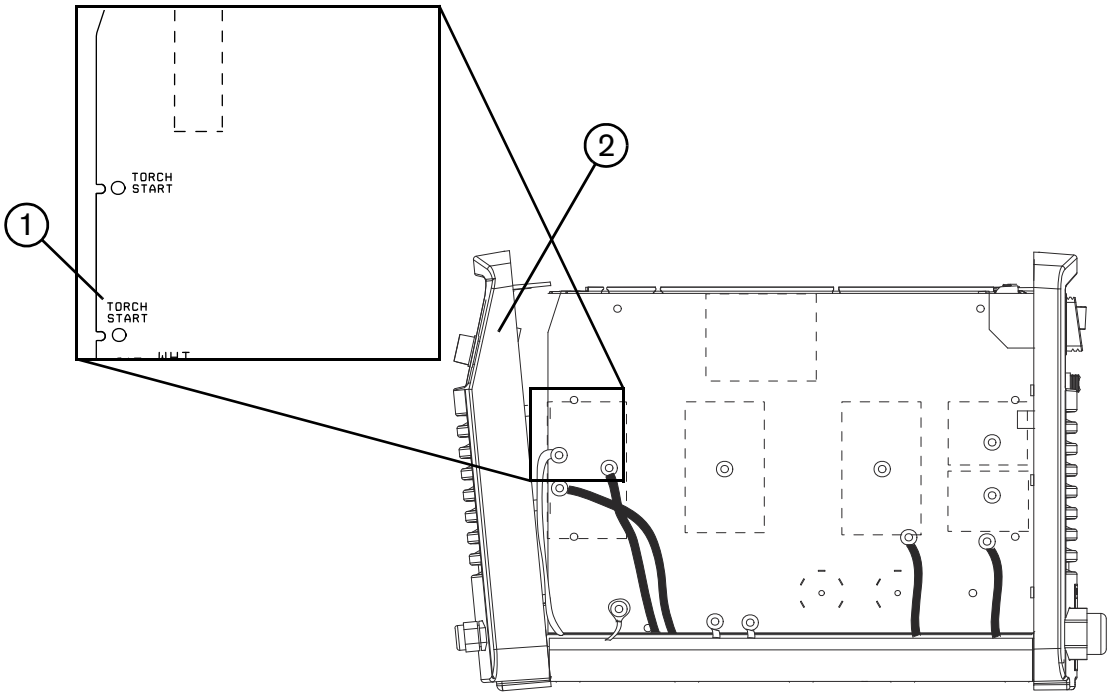

**1** Torch lead

**2** Plastic 90° fitting connected to brass gas supply fitting

**3** Front panel (hidden)

**3.** Locate the 3-pin connector at the TORCH START slot (J12) on the power board (on the side facing the heatsink) where the orange, blue, and purple wires from the torch lead connect.

**Figure 68**

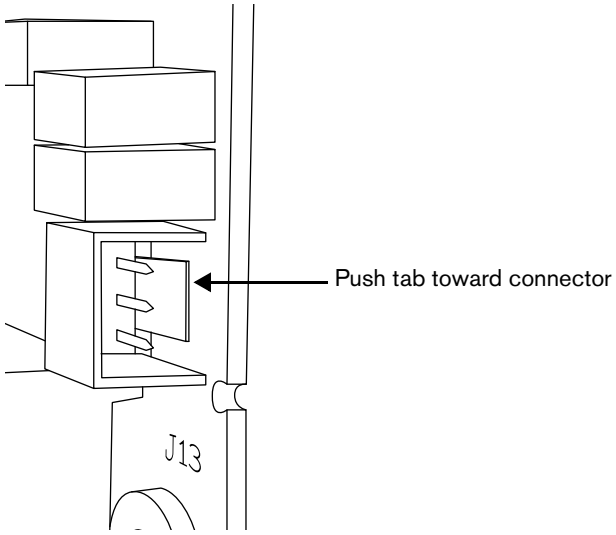



**1** TORCH START slot (J12)

**2** Front panel

4. Remove the connector at J12 by pressing up on the tab in the connection slot with a small blade screwdriver and then pulling the connector out toward the power supply's front panel.

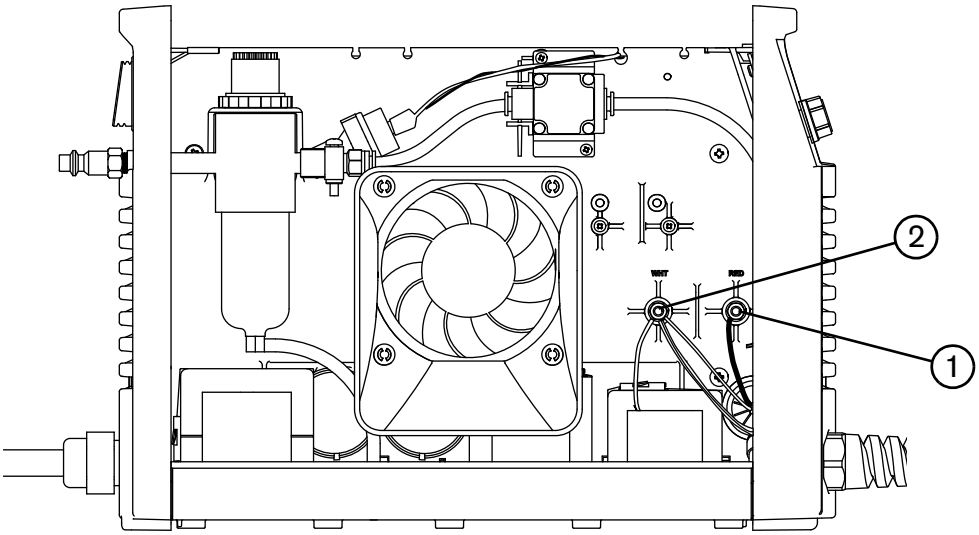
**Figure 69**




5. Locate the studs that attach the white wire group and the red wire from the torch lead to the power supply's center panel (on the fan side of the power supply).

6. Use an 8 mm (5/16 inch) nut driver to remove the nuts from the studs, and slide the ring terminals off the studs.

**Figure 70**




**1** Red wire

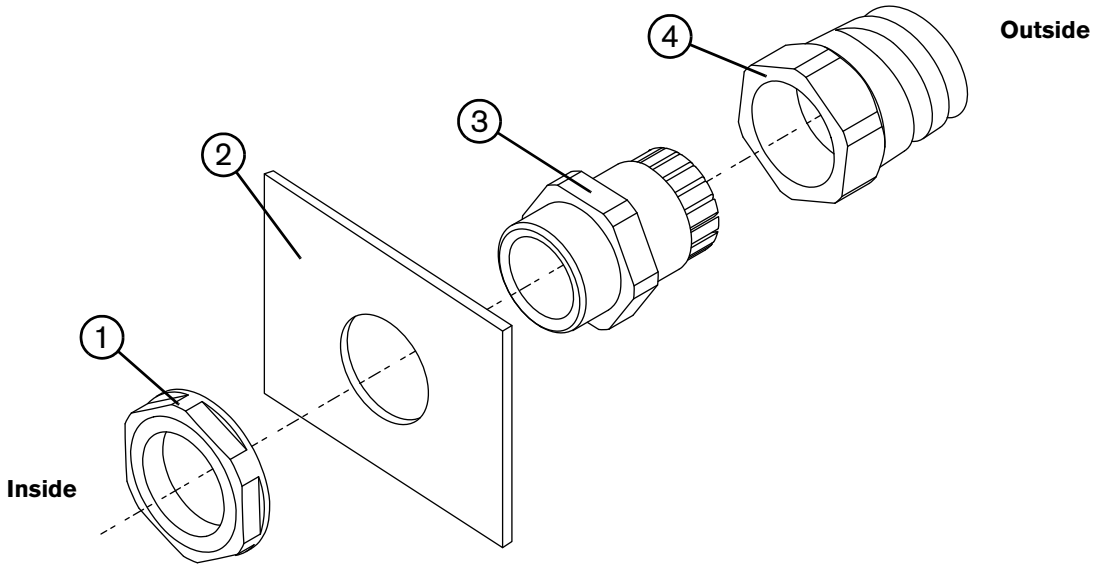
**2** White wire group

7. Loosen the strain relief nut on the torch lead outside the front panel.

8. On the inside of the front panel, unscrew the retention nut on the torch lead's strain relief so that the torch lead moves freely. (See *Figure 71* on page 136.)

9. Remove the torch lead by pulling the wires through the hole in the front panel. If you are replacing the strain relief, remove the strain relief from the front panel.

**Figure 71**




**1** Retention nut (inside power supply)

**2** Front panel

**3** Strain relief

**4** Strain relief nut

## Install the torch lead and strain relief

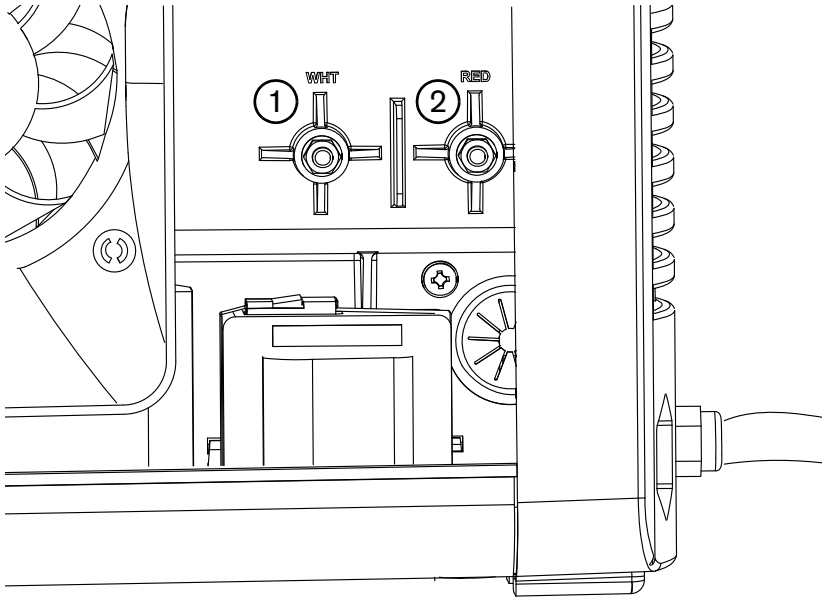
If you are replacing just the torch lead cable, not the whole torch assembly, refer to *Replacing the torch lead* on page 182 for details on how to connect the new lead to the torch.

1. Are you installing a new strain relief?
   - ❑ If yes, slide the new strain relief and strain relief nut over the new torch lead and up to the hole in the front panel.
   - ❑ If no, continue with the next step.
2. Route the wires for the new torch lead through the hole in the front panel and then through the retention nut for the strain relief.
3. Facing the fan side of the power supply, slide the ring terminal for the bundle of 3 white wires over the left stud (labeled “WHT” on the center panel).
4. Slide the ring terminal for the red wire onto the stud on the right (labeled “RED” on the center panel).

   If you removed any other wires from the WHT and RED studs, reinstall them.

5. Use an 8 mm (5/16 inch) nut driver to tighten the nut on each stud with a torque setting of 23.0 kg-cm (20 inch-pounds).

**Figure 72**




**1** WHT wire connection stud

**2** RED wire connection stud

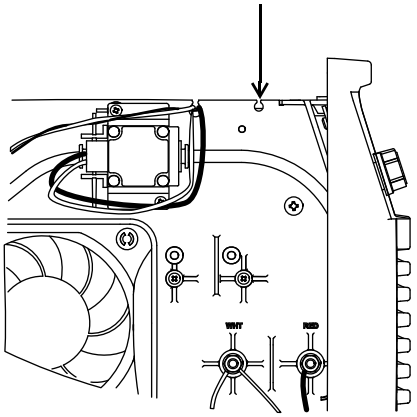
6. Push-to-connect the plastic 90° fitting onto the new torch lead’s brass gas supply fitting.

7. Route the orange, blue, and purple wire group over the center panel, with the wires resting in the notch in the panel that is closest to the front of the power supply. (See *Figure 73* on page 138.)

8. Press the connector into the TORCH START slot (J12) on the power board. (See *Figure 69* on page 135.)

**Figure 73**

Route the torch lead's orange, blue, and purple wires through this notch in the center panel



9. From the inside of the front panel, tighten the retention nut onto the strain relief.

**CAUTION!**

**Be careful not to twist the torch lead as you tighten the retention nut onto the strain relief.**

10. Tighten the torch lead's strain relief nut onto the strain relief as you put the front panel back in place. See *Reattach the front panel* on page 94.

11. Complete the following procedures:
    a. See *Install the power supply cover* on page 89.
    b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the pressure switch

| Kit number | Description |
|---|---|
| *228688* | *Kit: Pressure switch* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Disconnect the ground wire that is attached to the clip on the air filter/regulator's brass "T" fitting.
3. Disconnect the red and black wires from the pins on the pressure switch.
4. Use a 1-1/16 inch wrench or large adjustable wrench to remove the pressure switch from the brass elbow fitting on the air filter/regulator assembly. (See *Figure 74* on page 140.)
5. Apply a small drop of thread sealant to the middle threads of the new pressure switch. Do not apply thread sealant to the threads at the end of the pressure switch that will be inserted into the air filter/regulator assembly.

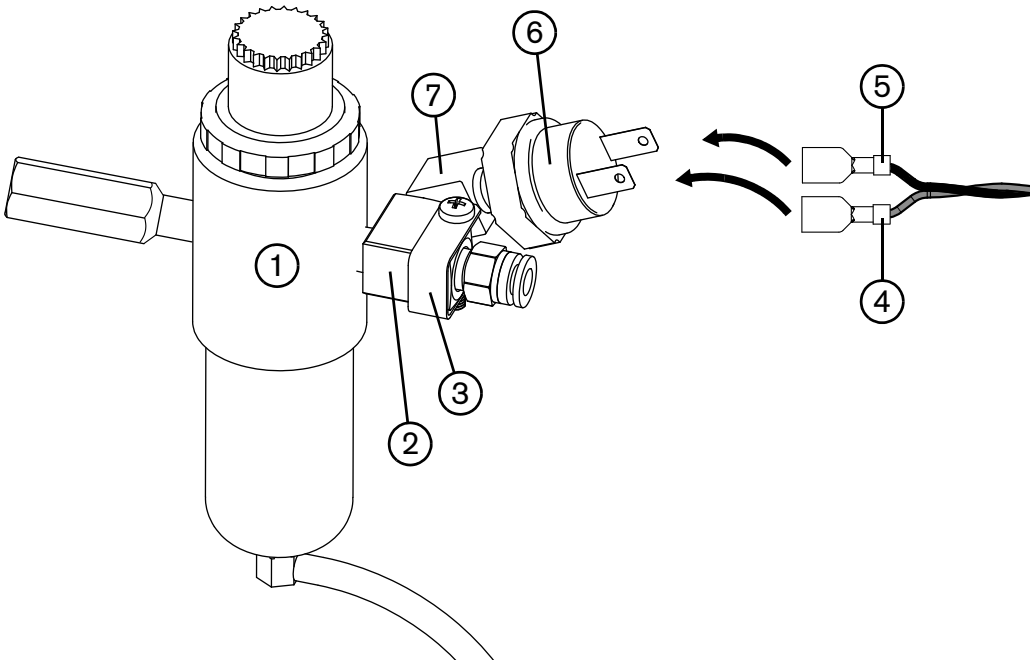
If applied too heavily, excess amounts of thread sealant can contaminate the gas line.

**CAUTION!**

**Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.**

6. Tighten the new pressure switch into the brass elbow fitting. Turn the pressure switch until its pins are horizontally aligned. Verify the pressure switch is angled up at approximately 45°. (See *Figure 74* on page 140.)
7. Press the black wire's connector onto the pressure switch pin that is nearest the center panel.
8. Press the red wire's connector onto the pressure switch pin that is farthest from the center panel.
9. Reconnect the ground wire to the clip on the brass "T" fitting with a torque setting of 11.5 kg-cm (10 inch-pounds).
10. Complete the following procedures:
    a. See *Install the power supply cover* on page 89.
    b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

**Figure 74**




**1** Air filter/regulator assembly
**2** Brass “T” fitting
**3** Ground wire clip
**4** Red wire
**5** Black wire
**6** Pressure switch
**7** Brass elbow fitting

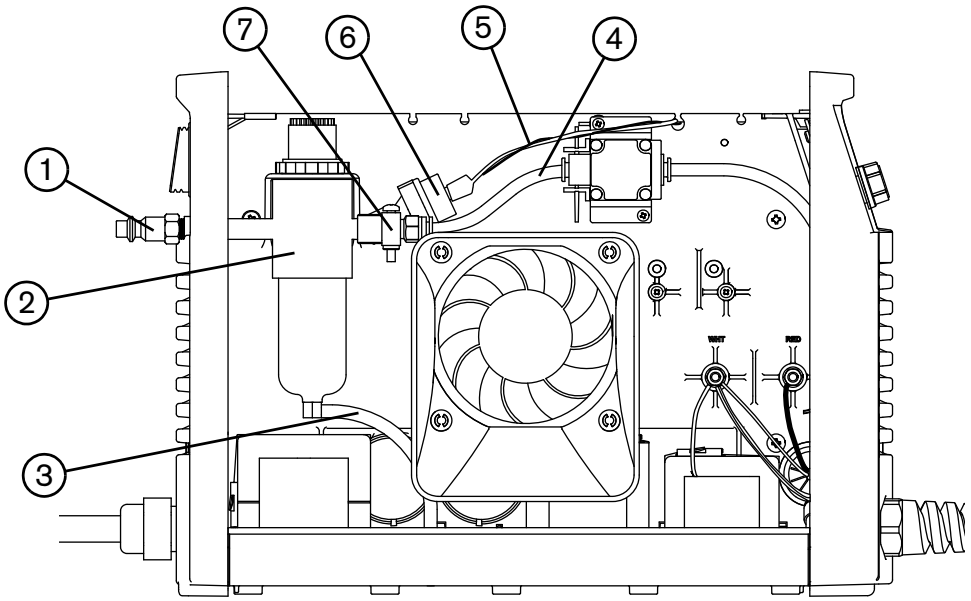
# Replacing the air filter/regulator and pressure switch assembly

| Kit number | Description |
|---|---|
| *228106* | *Kit: Air filter/regulator with pressure switch* |

## Remove the air filter/regulator and pressure switch assembly

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. Use 2 wrenches to remove the air fitting from the brass hex adapter that connects the fitting to the air filter/regulator. See *Figure 75*.
   - **CSA models:** Use a 9/16 inch wrench for the air fitting and a 5/8 inch wrench for the hex adapter.
   - **CE/CCC models:** Use a 19 mm wrench for the air fitting adapter and a 5/8 inch wrench for the hex adapter.
3. Disconnect the drain hose from the hole in the bottom of the power supply's base. See *Figure 75*.
4. Disconnect the red and black wires from the pins on the pressure switch.
5. Push-to-disconnect the gas supply hose from the air filter/regulator's brass "T" fitting. (See *Figure 56* on page 119.)
6. Disconnect the ground wire that is attached to the clip on the air filter/regulator's brass "T" fitting. Set the clip aside.

**Figure 75**




**1** Air fitting (CSA) or air fitting adapter (CE/CCC)

**2** Air filter/regulator

**3** Drain hose

**4** Gas supply hose

**5** Red and black pressure switch wires

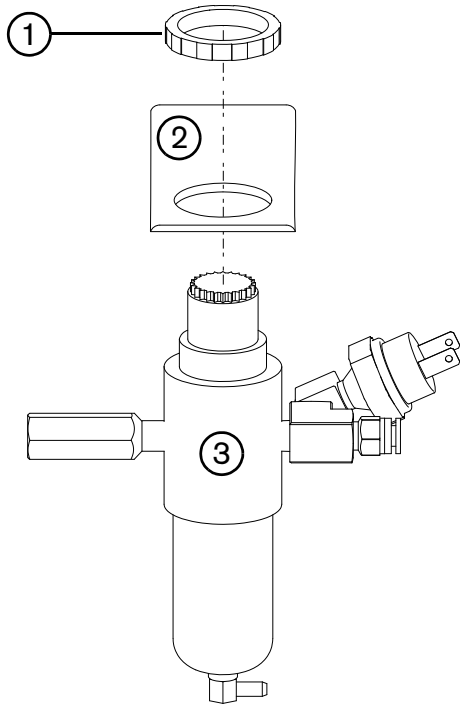
**6** Pressure switch

**7** Ground wire clip on the “T” fitting

**7.** Unscrew the retainer nut that holds the air filter/regulator in the bracket on the center panel. See *Figure 76*.

**8.** Tip the bottom of the air filter/regulator and pressure switch assembly away from the power supply, and slide the assembly out of the bracket. Gently tilt the top of the rear panel away from the power supply as you remove the assembly, if needed.

**Figure 76**




**1** Retainer nut

**2** Center panel bracket

**3** Air filter/regulator

## Install the air filter/regulator and pressure switch assembly

This kit contains two fittings that are not used in the Powermax30 XP: a brass coupler (015550) and a brass pipe (015618).

**CAUTION!**

**The regulator is pre-set at the factory. Do not adjust this setting.**

1. Locate the new brass hex adapter fitting (015846) in the kit. Apply a small drop of thread sealant to the middle threads of the fitting. Do not apply thread sealant to the threads at the end of the fitting that will be inserted into the air filter/regulator assembly. See *Figure* 77 on page 145.

If applied too heavily, excess amounts of thread sealant can contaminate the gas line.

**CAUTION!**

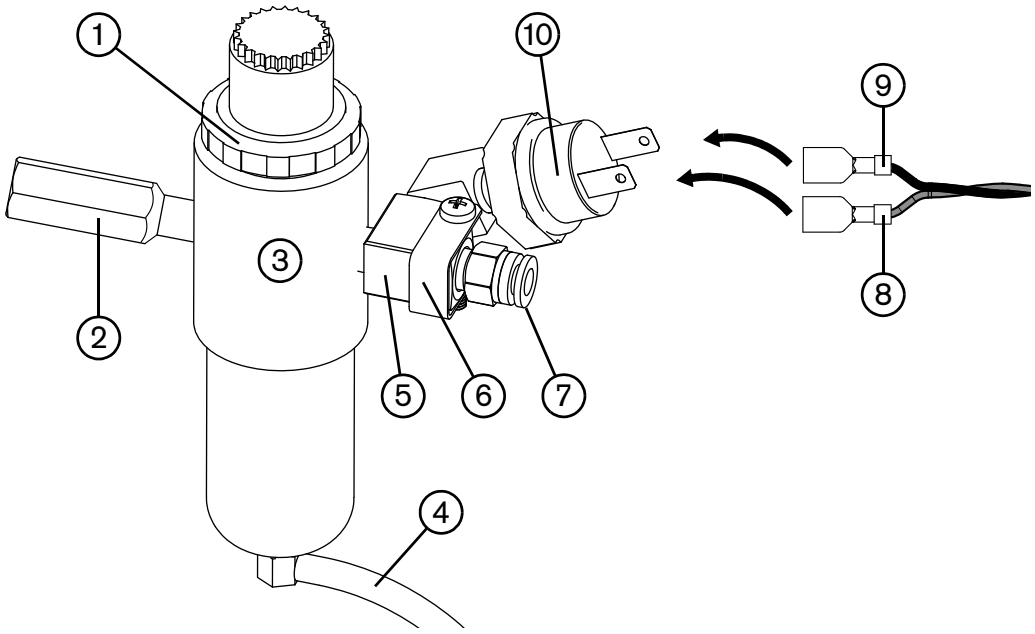
**Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.**

2. Screw the hex adapter fitting into the side of the air filter/regulator, and use a 5/8 inch wrench to tighten.
3. Position the new air filter/regulator assembly in the bracket on the center panel of the power supply. Hand-tighten the retainer nut plus a quarter turn.

Do not overtighten the retainer nut.

4. Route the drain hose through the hole in the base of the power supply.
5. Connect the red and black wires to the pins on the pressure switch (see *Figure* 77):
   a. Press the black wire's connector onto the pressure switch pin that is nearest the center panel.
   b. Press the red wire's connector onto the pressure switch pin that is farthest from the center panel.
6. Push-to-connect the gas supply hose to the fitting on the new air filter/regulator. Be careful not to kink the hose as you reconnect it.
7. Using the clip you removed in step 6 on page 141, connect the ground wire to the air filter/regulator's brass "T" fitting.
8. Reconnect the air fitting (CSA models) or air fitting adapter (CE/CCC models) to the brass hex adapter in the air filter/regulator assembly.

**Figure 77**




**1** Retainer nut
**2** Brass hex adapter
**3** Air filter/regulator assembly
**4** Drain hose
**5** Brass “T” fitting
**6** Ground wire clip
**7** Push-to-connect fitting for gas supply hose
**8** Red wire
**9** Black wire
**10** Pressure switch

**9.** Reconnect the gas supply, and check for leaks at each fitting and hose connection point on the air filter/regulator assembly.

**CAUTION!**

**Gas supply pressures not within the specifications in the *Specifications* section of your system’s manual can cause poor cut quality, poor consumable life, and operational problems.**

**If the purity level of the gas is too low, or if there are leaks in the supply hoses or connections:**

- **Cut speeds can decrease.**
- **Cut quality can deteriorate.**
- **Cutting thickness capability can decrease.**
- **Consumables life can be shortened.**

**10.** Complete the following procedures:

**a.** See *Install the power supply cover* on page 89.

**b.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the air inlet fittings

| Kit number | Description |
|---|---|
| *428171* | *Kit: Air inlet fittings, CSA* |
| *428172* | *Kit: Air inlet fittings, CE/CCC* |

Each of these kits contains two fittings that are not used in the Powermax30 XP: a brass coupler (015550) and a brass pipe (015618).

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. **CSA models:** Are you replacing the quick-connect air fitting? (See *Figure 78* on page 147.)
   - If yes, continue with the next step.
   - If no, remove the quick-connect air fitting from the brass hex adapter. Use a 5/8 inch wrench for the hex adapter and a 9/16 inch wrench for the air fitting. Set the fitting aside.

   **CE/CCC models:** Are you replacing the air fitting adapter? (See *Figure 78* on page 147.)
   - If yes, continue with the next step.
   - If no, remove the air fitting adapter from the brass hex adapter. Use a 5/8 inch wrench for the hex adapter and a 19 mm wrench for the air fitting adapter. Set the air fitting adapter aside.
3. Grip the air filter/regulator with your right hand to hold it steady. With your left hand, remove the brass hex adapter from the air filter/regulator using a 5/8 inch wrench.
4. Apply a small drop of thread sealant to the middle threads of the new brass hex adapter. Do not apply thread sealant to the threads at the end of the fitting that will be inserted into the air filter/regulator assembly.

   If applied too heavily, excess amounts of thread sealant can contaminate the gas line.

**CAUTION!**

**Never use PTFE tape on any joint preparation. Use only a liquid or paste thread sealant on male threads.**

5. Screw the brass hex adapter into the air filter/regulator. Use a 5/8 inch wrench to tighten.
6. **CSA models:** Apply a small drop of thread sealant to the middle threads of the quick-connect air fitting. Screw the fitting into the brass hex adapter. Use a 9/16 inch wrench to tighten.

   **CE models:** Apply a small drop of thread sealant to the middle threads on the smaller end (1/4 NPT) of the air fitting adapter. Screw the air fitting adapter into the brass hex adapter. Use a 19 mm wrench to tighten.

**7.** Reconnect the gas supply, and check for leaks at each fitting and hose connection point on the air filter/regulator assembly.

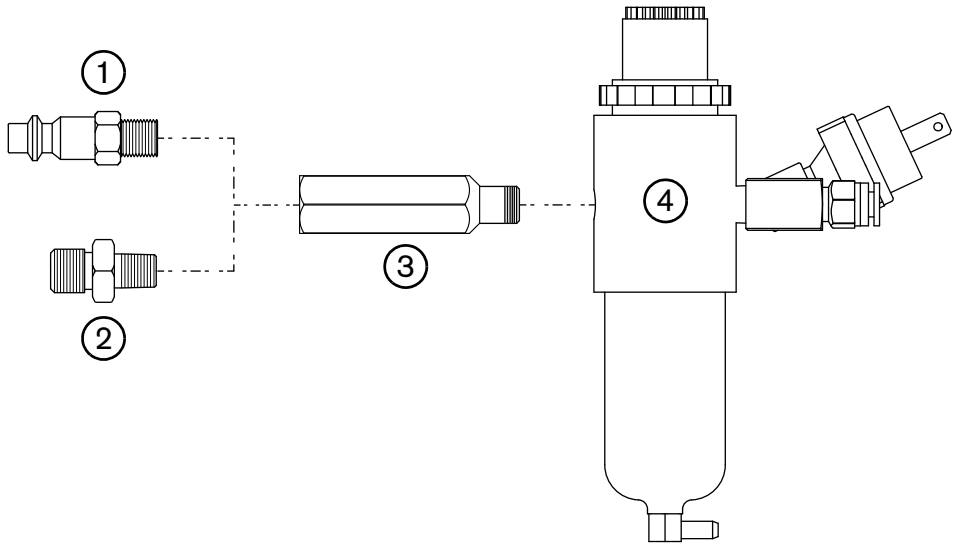
**CAUTION!**

**Gas supply pressures not within the specifications in the *Specifications* section of your system's manual can cause poor cut quality, poor consumable life, and operational problems.**

**If the purity level of the gas is too low, or if there are leaks in the supply hoses or connections:**

- **Cut speeds can decrease.**
- **Cut quality can deteriorate.**
- **Cutting thickness capability can decrease.**
- **Consumables life can be shortened.**

**Figure 78**




**1** CSA quick-connect air fitting

**2** CE/CCC air fitting adapter

**3** Brass hex adapter

**4** Air filter/regulator

**8.** Complete the following procedures:

**a.** See *Install the power supply cover* on page 89.

**b.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

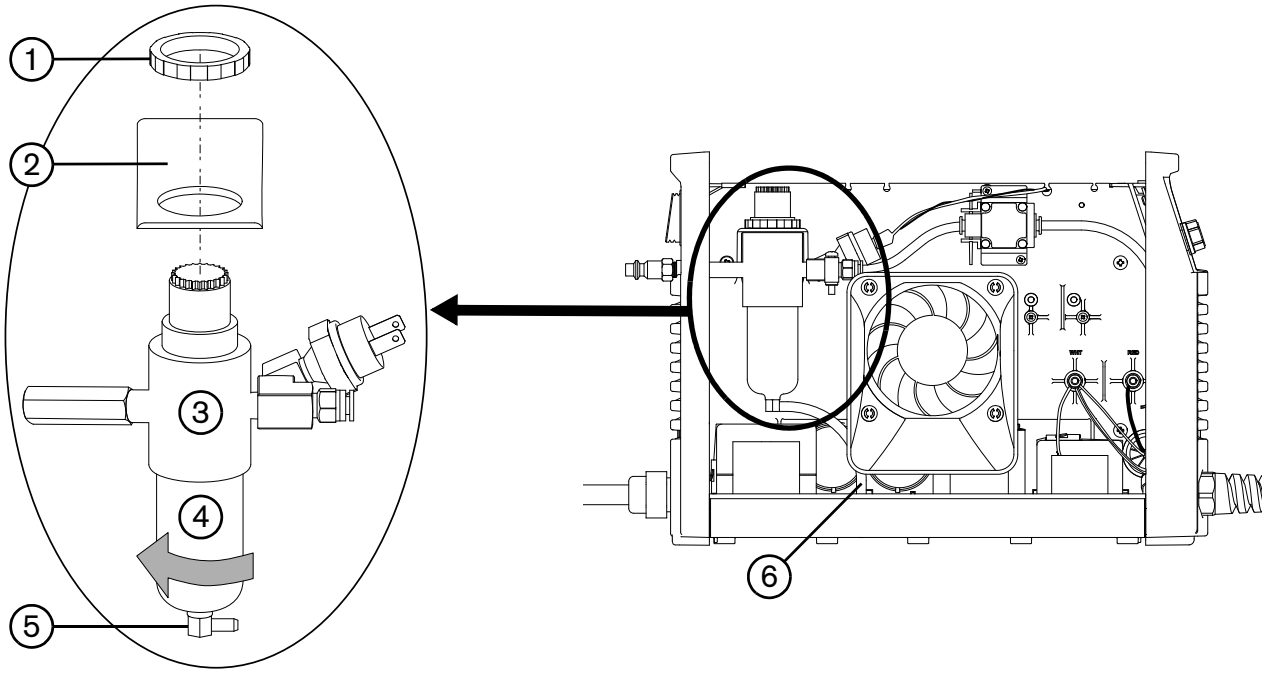
# Replacing the air filter bowl and air filter element

| Kit number | Description |
|---|---|
| *428237* | *Kit: Air filter element* |
| *428246* | *Kit: Air filter bowl* |

## Remove the air filter bowl and air filter element

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
2. From the fan side of the power supply, disconnect the drain hose from the hole in the bottom of the base.
3. Remove the other end of the drain hose from the brass fitting at the bottom of the air filter bowl. Set the drain hose aside.
4. Unscrew the plastic retainer nut that holds the air filter/regulator in the bracket on the center panel.
5. Tilt the bottom of the air filter/regulator assembly towards you with one hand.
6. With your other hand, unscrew the air filter bowl to remove it from the air filter/regulator assembly.

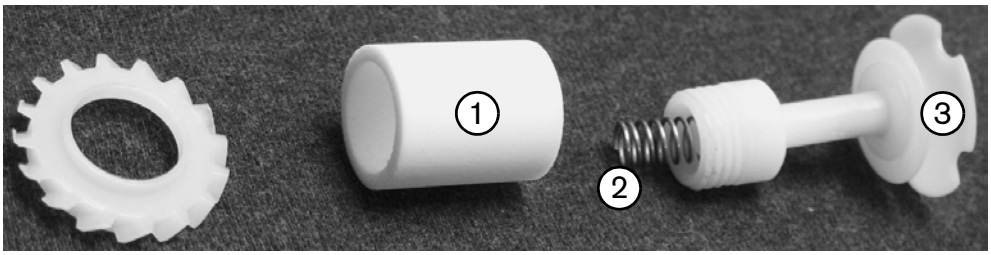
Figure 79




**1** Plastic retainer nut (red)
**2** Center panel bracket
**3** Air filter/regulator
**4** Air filter bowl
**5** Brass fitting
**6** Drain hose

7. Does the air filter element need to be replaced?
   - ❑ If yes, unscrew the plastic retaining nut that attaches the air filter element, being careful not to lose the spring that is compressed between the retaining nut and the air filter/regulator. Do not allow the air filter element to rotate as you remove the nut. Remove the air filter element from the plastic retaining nut.
   - ❑ If no, continue with step 3 on page 150.

**Figure 80**




**1** Air filter element
**2** Spring
**3** Retaining nut

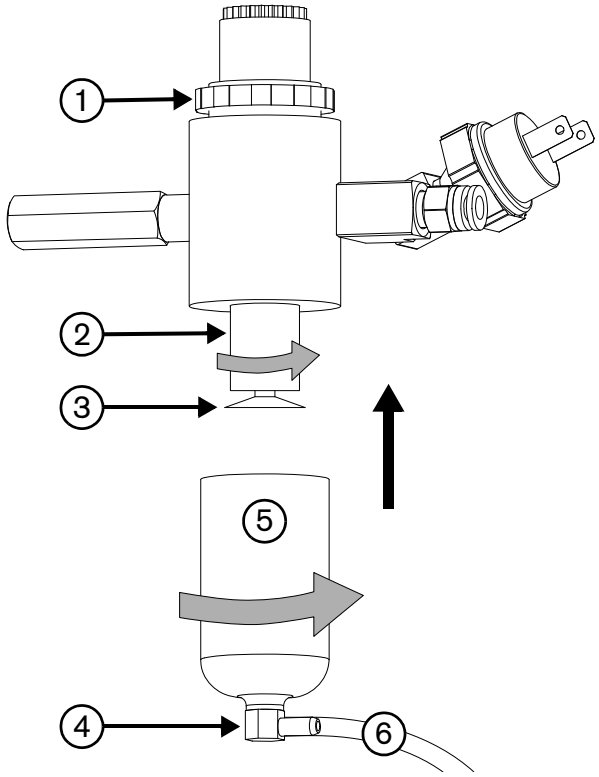
## Install the air filter element and air filter bowl

1. Place the new air filter element on the plastic retaining nut. Verify that the spring is in place.
2. Install the new air filter element. Tighten the retaining nut to finger-tight.
3. Does the air filter bowl need to be replaced?
   - ❑ If yes, install the new filter bowl.
   - ❑ If no, clean the bowl before reinstalling it by wiping away any oil, dirt, or other contaminants.

   Tighten the filter bowl to finger-tight.
4. Connect the drain hose to the fitting at the bottom of the filter bowl. Verify the drain hose extends towards the front of the power supply.
5. Position the air filter/regulator assembly in the bracket on the center panel of the power supply, and attach it using the plastic retainer nut. Hand-tighten the retainer nut plus a quarter turn.

   Do not overtighten the retainer nut.
6. Route the drain hose through the hole in the base of the power supply.

**Figure 81**




**1** Plastic retainer nut (red)
**2** Air filter element
**3** Air filter element retaining nut (white)
**4** Brass fitting
**5** Air filter bowl
**6** Drain hose

**7.** Reconnect the gas supply, and check for leaks at each fitting and hose connection point on the air filter/regulator assembly.

**CAUTION!**

**Gas supply pressures not within the specifications in the *Specifications* section of this manual can cause poor cut quality, poor consumable life, and operational problems.**

**If the purity level of the gas is too low, or if there are leaks in the supply hoses or connections:**

- **Cut speeds can decrease.**
- **Cut quality can deteriorate.**
- **Cutting thickness capability can decrease.**
- **Consumables life can be shortened.**

8. Complete the following procedures:
   a. See *Install the power supply cover* on page 89.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the front panel

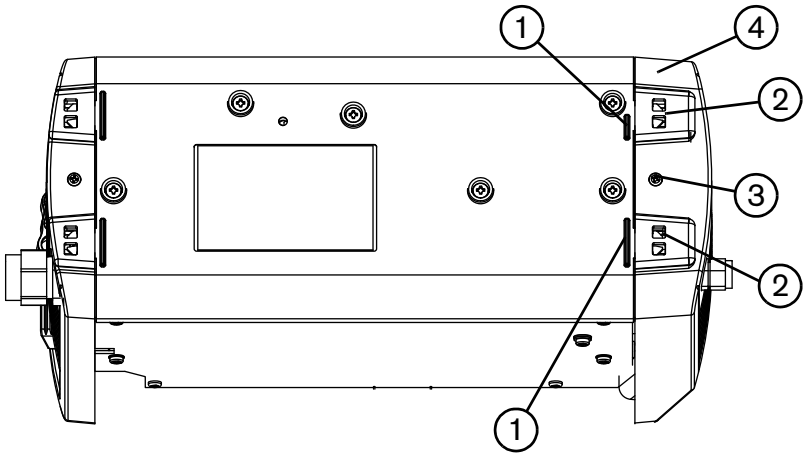
| Kit number | Description |
|---|---|
| *428219* | *Kit: Front panel* |

### Remove the front panel

Use the following procedure to completely remove the front panel in order to replace it. If you just need to move the front panel out of the way to provide better access to the interior of the power supply, see *Detach the front panel* on page 92 and *Reattach the front panel* on page 94.

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
2. Lay the power supply on its side.
3. Remove the retaining screw from the bottom of the front panel.

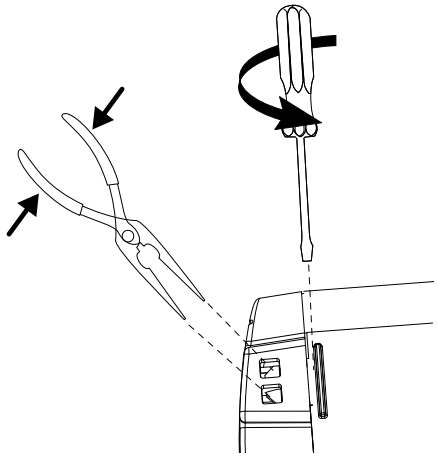
**Figure 82**




**1** Rib
**2** Snap
**3** Retaining screw
**4** Front panel

4. Insert needle nose pliers into the opening for one of the snaps and use the pliers to squeeze it together.

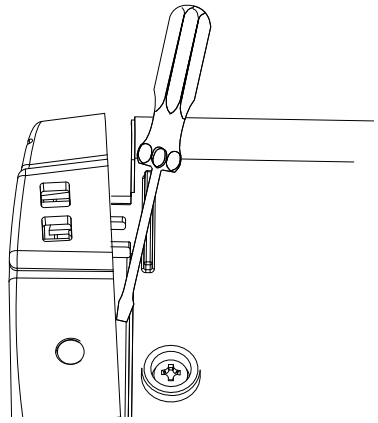
**Figure 83**



5. Place a blade screwdriver against the raised rib next to the snap and gently turn the screwdriver to push the panel away from the base.

6. Place another screwdriver or similar object into the opening between the panel and the base to keep the first corner of the panel from re-engaging the snaps when you release the other corner.

**Figure 84**

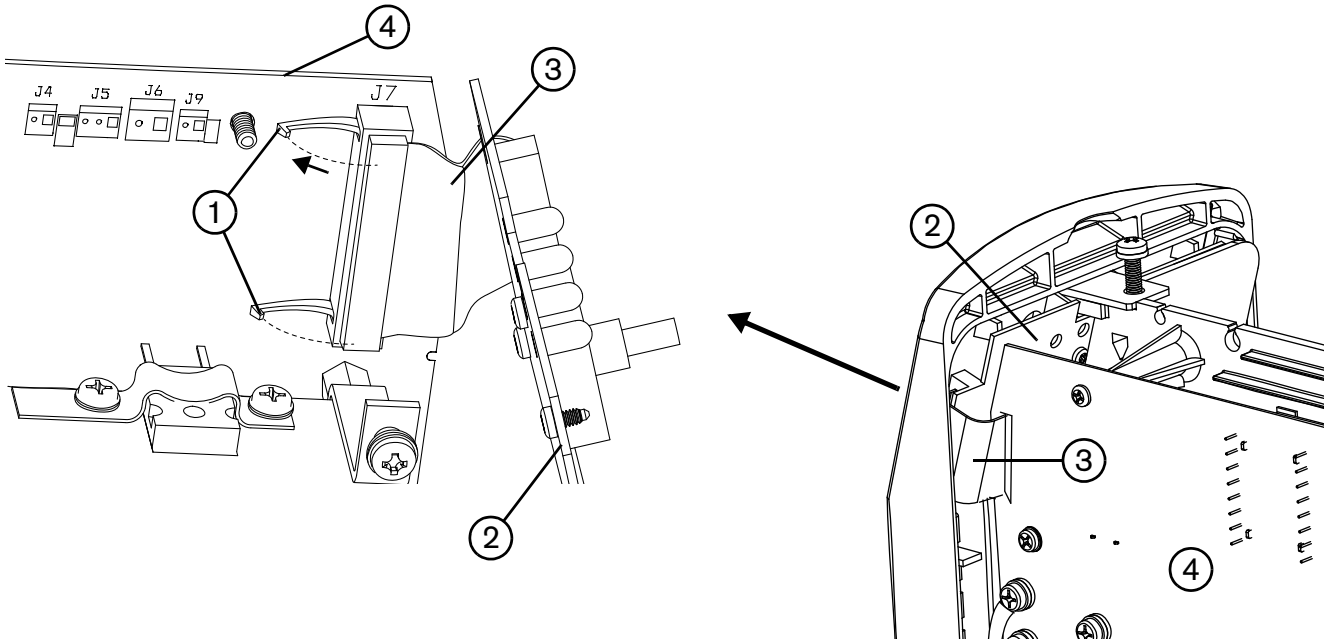


7. Repeat step 4 and step 5 on the other corner of the panel.

**8.** Disconnect the control panel ribbon cable from the power board by folding the latches back.

In *Figure 85*, the center panel is hidden in the image on the left.

**Figure 85**




**1** Latches

**2** Control board

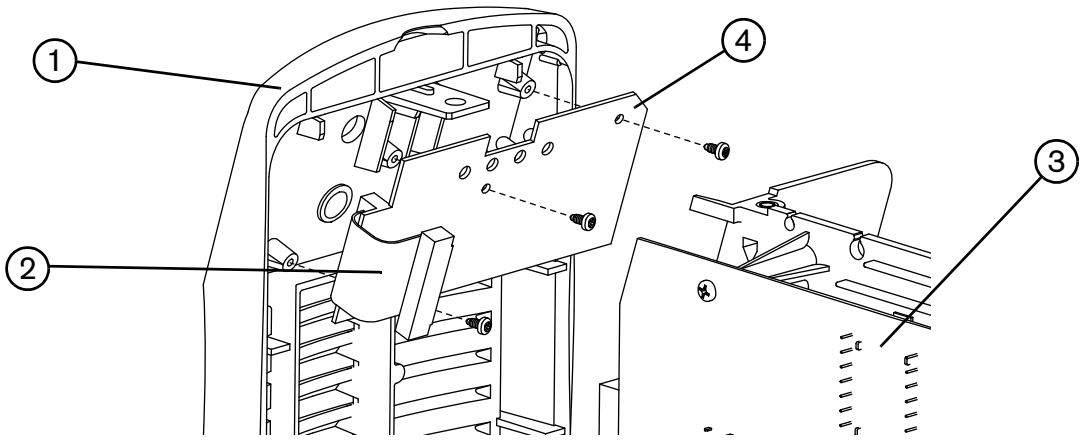
**3** Ribbon cable

**4** Power board

9. Remove the amperage adjustment knob from the front of the power supply by pulling it away from the front panel. (It does not have a set screw.) Set the knob aside.

10. Remove the 3 retaining screws from the control board, and lift it out of the front panel. Set aside the control panel and its screws.

**Figure 86**




| | | | |
|---|---|---|---|
| **1** | Front panel | **3** | Power board |
| **2** | Ribbon cable | **4** | Control board |

11. Disconnect the torch lead from the power supply. See *Remove the torch lead and strain relief* on page 133.

12. Disconnect the work lead from the power supply. See *Remove and install the work lead* on page 167.

## Install the front panel

1. Push the new front panel into the power supply base to re-engage the snaps.

2. Tighten the retaining screw to a torque setting of 8.1 kg-cm (7 inch-pounds).

3. Attach the control board to the new front panel with the three retaining screws.

4. Press the amperage adjustment knob onto the post on the new front panel.

5. Reinstall the work lead and the torch lead. See *Remove and install the work lead* on page 167 and *Install the torch lead and strain relief* on page 137.

6. Connect the control panel ribbon cable to the power board, and fold the latches up to hold it in place.

7. Complete the following procedures:
   a. See *Install the component barrier* on page 91.
   b. See *Install the power supply cover* on page 89.
   c. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

# Replacing the rear panel

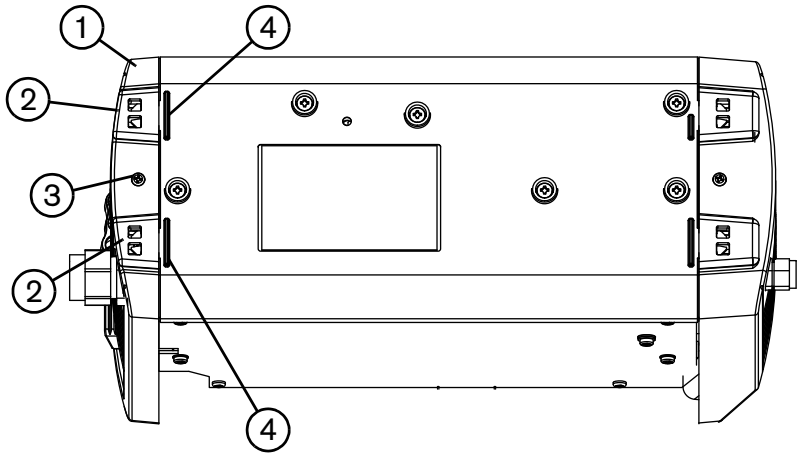
| Kit number | Description |
|---|---|
| *428220* | *Kit: Rear panel* |

## Remove the rear panel

Use the following procedure to completely remove the rear panel in order to replace it. If you just need to move the rear panel out of the way to provide better access to the interior of the power supply, see *Detach the rear panel* on page 95 and *Reattach the rear panel* on page 97.

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
2. Lay the power supply on its side.

**Figure 87**

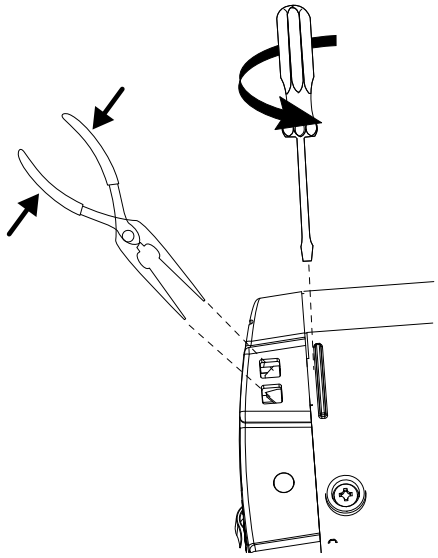



**1** Rear panel
**2** Snap
**3** Retaining screw
**4** Rib

3. Remove the retaining screw from the bottom of the rear panel.

4. Insert needle nose pliers into the opening for one of the snaps and use the pliers to squeeze it together.

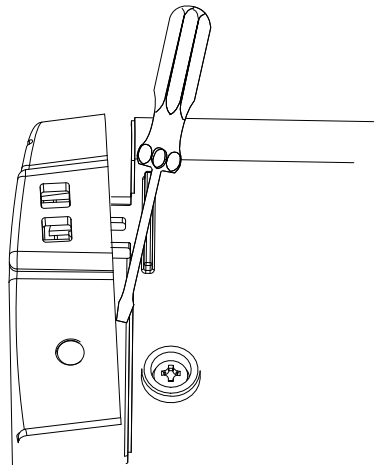
**Figure 88**



5. Place a blade screwdriver against the raised rib next to the snap and gently turn the screwdriver to push the panel away from the base.

6. Place another screwdriver or similar object into the opening between the panel and the base to keep the first corner of the panel from re-engaging the snaps when you release the other corner.

**Figure 89**



7. Repeat step 4 and step 5 on the other corner of the panel.

**8.** Disconnect the ground wire from the ground wire clip near the top of the rear panel. See *Figure 90*.

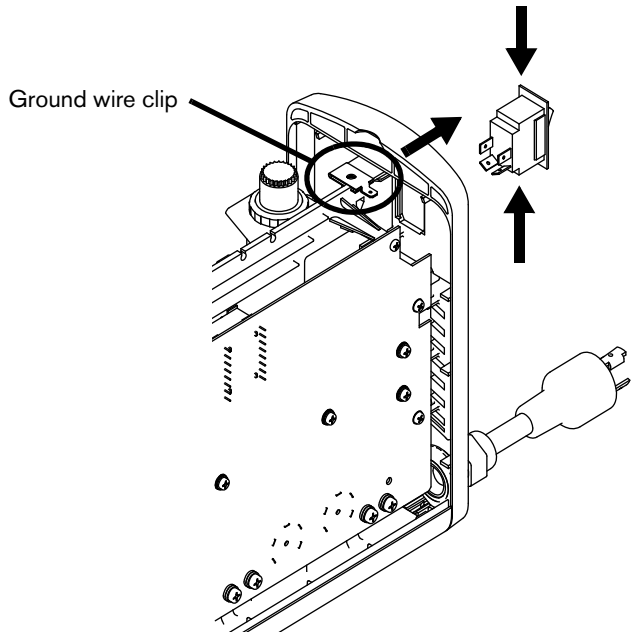
**9.** Disconnect the 4 wires from the back of the power switch.

**10.** Using a small blade screwdriver, press down one of the tabs on the top of the power switch, and push that corner of the switch out of the rear panel.

**11.** Press down the other tab on the top of the power switch, and push that corner of the switch out of the panel. Make sure the first tab does not snap back into place as you release the second tab.

**12.** Repeat the previous two steps on the bottom of the power switch to push the bottom of the switch out of the rear panel. Remove the switch completely from the panel.

**Figure 90**



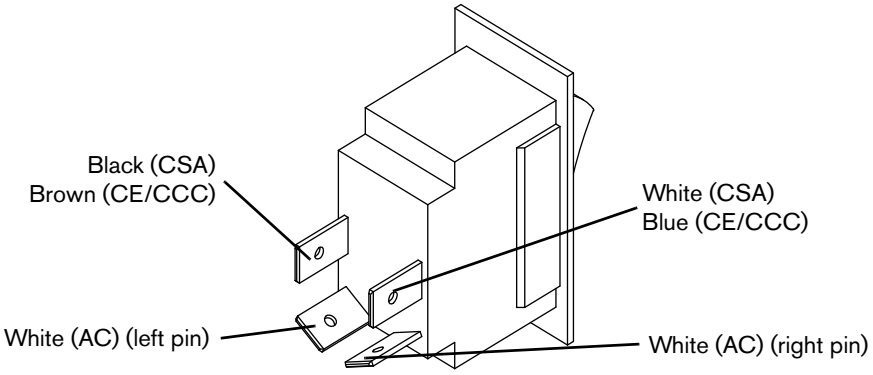

**13.** Disconnect the power cord from the power supply. See *Remove the power cord and strain relief* on page 98.

## Install the new rear panel

1. Reinstall the power cord through the new rear panel. See *Install the power cord and strain relief* on page 103.
2. Push the new rear panel into the base to re-engage the snaps.
3. Tighten the retaining screw. Make sure that the hole in the ground clip is aligned with the screw holes in the panel and the power supply before attempting to insert the retaining screw.
4. Press the power switch into the new rear panel with the ON (**I**) label at the top of the switch.

   You should hear the switch snap into place.
5. Push the connectors for the two white wires that are attached to the power board at AC onto the bottom two pins of the power switch. The left “AC” wire connects to the bottom-left pin on the power switch; the right “AC” wire connects to the bottom-right pin on the power switch. See *Figure 91*.
6. Press the connector for the black (CSA) or brown (CE/CCC) wire onto the pin on the upper left side of the power switch.
7. Press the connector for the white (CSA) or blue (CE/CCC) wire onto the pin on the upper right side of the power switch.

**Figure 91**



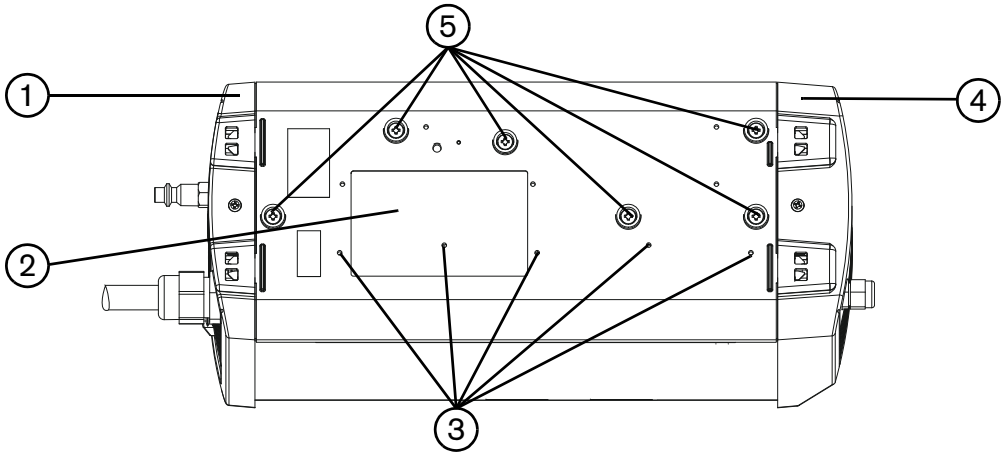

8. Reconnect the ground wire to the ground wire clip on the rear panel.
9. Complete the following procedures:
   a. See *Install the component barrier* on page 91.
   b. See *Install the power supply cover* on page 89.
   c. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the base

| Kit number | Description |
|---|---|
| *228139* | *Kit: Plastic base* |

1. Verify that the serial number on the bottom of the old base matches the one on the new base. Contact Hypertherm if the serial numbers do not match. The serial number can be found on the data plate.
2. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
   d. See *Detach the front panel* on page 92.
   e. See *Detach the rear panel* on page 95.
3. On the fan side of the power supply, disconnect the air filter/regulator's drain hose from the hole in the bottom of the base.
4. Lay the power supply on its side, with the fan side facing up.
5. Remove the six screws that attach the plastic base to the components at the bottom of the power supply.
6. Place the wooden end of a swab, a stiff wire, or other similar item with a 0.23 cm (0.092-inch) diameter in each of the five holes on the power board side of the base. Press each one until the clips release and you can pull the base away from the center panel.

**Figure 92**




1 Rear panel
2 Data plate location
3 Holes
4 Front panel
5 Bottom component screws

7. Position the new base over the metal plate on the bottom of the power supply so that the screw holes align with the holes in the metal base plate for the bottom components.

8. Press the plastic base into the power supply until it snaps into place.

9. Attach the plastic base to the bottom components using the six screws.

10. Reconnect the air filter/regulator's drain hose to the hole in the bottom of the base.

11. Complete the following procedures:
    a. See *Reattach the front panel* on page 94.
    b. *See Reattach the rear panel* on page 97.
    c. See *Install the component barrier* on page 91.
    d. See *Install the power supply cover* on page 89.
    e. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

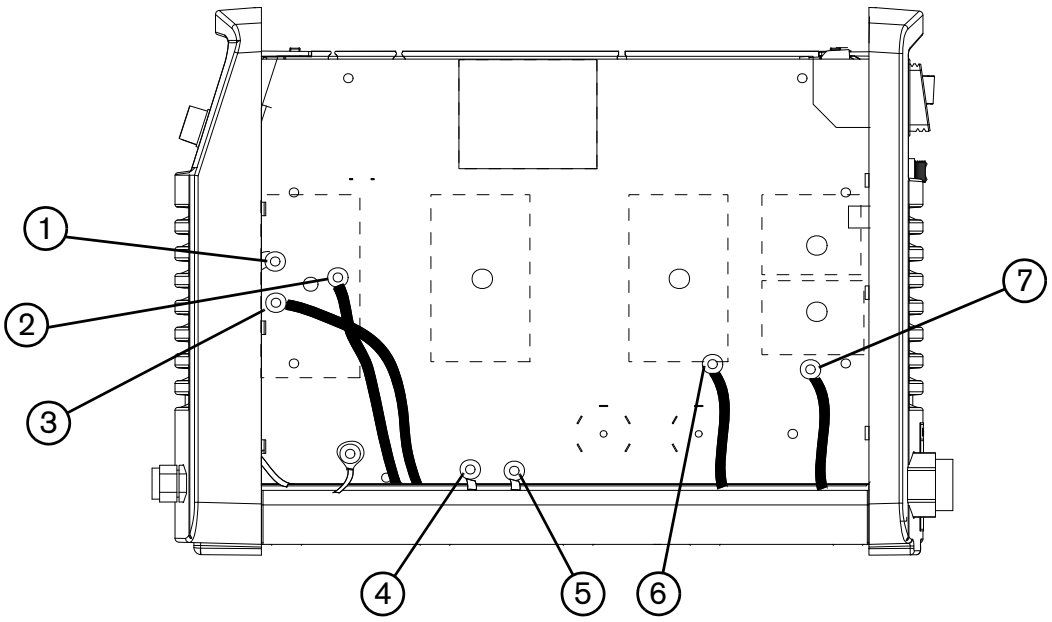
## Replacing the magnetics assembly

| Kit number | Description |
|---|---|
| *428230* | *Kit: Magnetics assembly* |

Replacement transformers and inductors (the magnetics) for this power supply are available only as a complete assembly with the components already mounted on a metal base plate. You cannot replace individual components.

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
   d. See *Detach the front panel* on page 92.
   e. See *Detach the rear panel* on page 95.
2. From the power board side of the power supply, remove the wires for the transformers and inductors. (See *Figure 93*.)
   a. Remove J13, J14, and J15, located on the front panel end of the power board.
   b. Remove J18 and J19, located on the rear panel end of the power board.
   c. Remove J20 and J21, located on the bottom center of the power board.

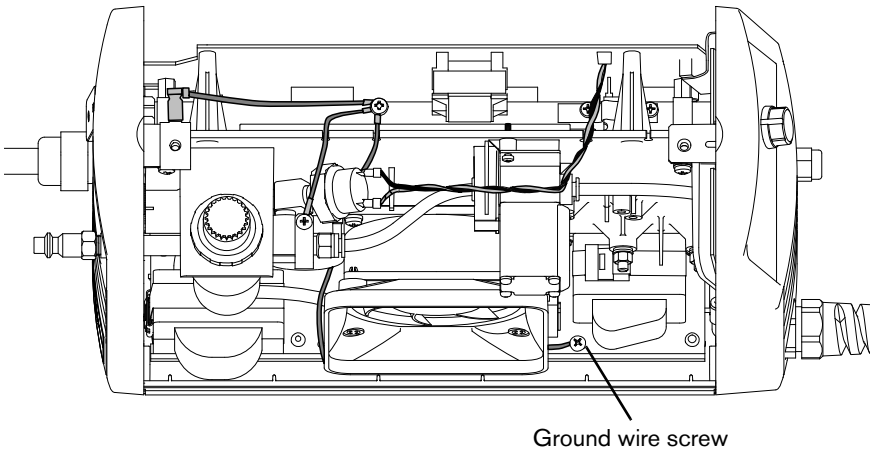
**Figure 93**




**1** J13
**2** J14
**3** J15
**4** J21
**5** J20
**6** J19
**7** J18

**3.** On the fan side of the power supply, remove the ground wire screw from the base of the magnetics assembly.

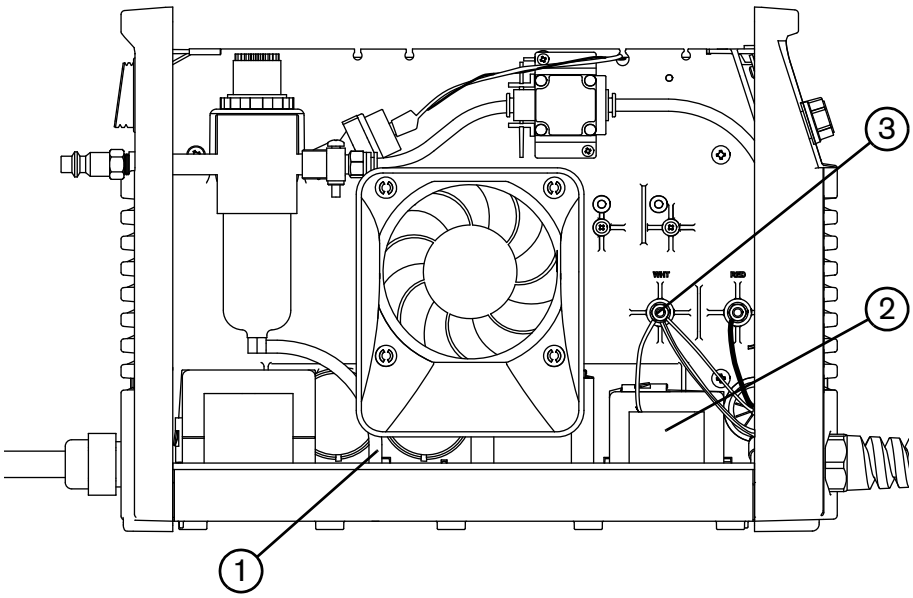
**Figure 94**



4. Disconnect the air filter/regulator's drain hose from the hole in the base of the power supply.

5. Use a 8 mm (5/16 inch) nut driver to remove the nut that attaches the ring connector for the output inductor's white wire to the stud labeled "WHT."

**Figure 95**



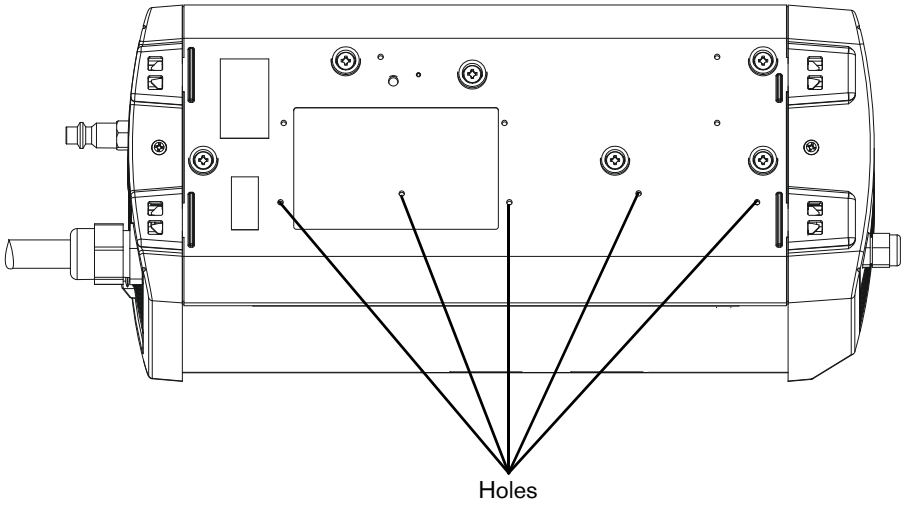

**1** Drain hose

**2** Output inductor

**3** White wire stud ("WHT")

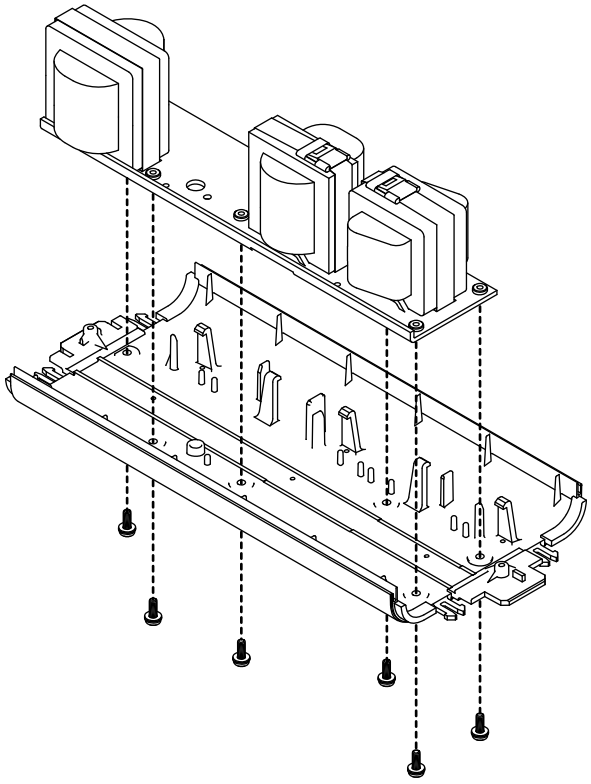
6. Place the wooden end of a swab, a stiff wire, or other similar item with a 0.23 cm (0.092 inch) diameter in each of the five holes on the power board side of the base. Press each one in until the clips release and you can pull the base and the attached magnetics away from the center panel.

**Figure 96**




7. Remove the six screws that hold the magnetics' metal mounting plate in place. Remove the plate and the magnetics.

**Figure 97**



8. Align the screw holes in the plastic base with the screw holes in the metal plate on the bottom of the new magnetics assembly.

9. Attach the new magnetics to the plastic base using the six screws.

10. Align the wires from the magnetics with the notches in the center panel so that the wires do not get pinched.

11. Press the plastic base and the magnetics into the bottom of the power supply until the assembly snaps into place.

12. On the fan side of the power supply, attach the ring connector for the output inductor's white wire to the stud labeled "WHT" using a 8 mm (5/16 inch) nut driver. See *Figure 95* on page 164.

    If you removed any other wires from the WHT stud, reinstall them.

13. Reconnect the air filter/regulator's drain hose to the hole in the bottom of the base.

14. Using the screw you removed in step 3 on page 163, attach the ground wire to the metal base plate of the magnetics assembly with a torque setting of 17.3 kg-cm (15 inch-pounds). See *Figure 94* on page 163.

15. On the power board side of the power supply, connect the wires for the transformers and inductors on the new magnetics assembly to the power board at J13, J14, J15, J18, J19, J20, and J21. Tighten each screw to 23.0 kg-cm (20 inch-pounds). See *Figure 93* on page 163.

16. Complete the following procedures:
    a. See *Reattach the front panel* on page 94.
    b. *See Reattach the rear panel* on page 97.
    c. See *Install the component barrier* on page 91.
    d. See *Install the power supply cover* on page 89.
    e. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

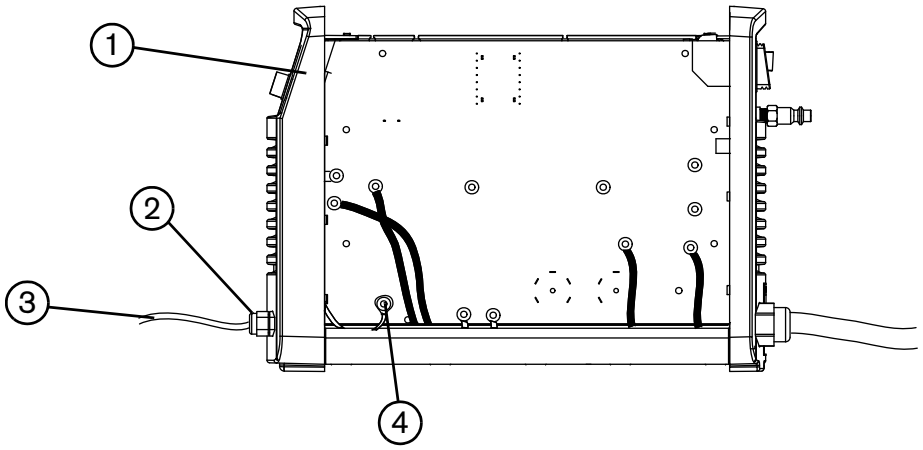
## Replacing the work lead and ground clamp

| Kit number | Description |
|---|---|
| *428239* | *Kit: Work lead, 4.6 m (15 feet), with ground clamp* |
| *228561* | *Kit: Ground clamp* |

### Remove and install the work lead

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. See *Remove the power supply cover* on page 88.
   c. See *Remove the component barrier* on page 90.
   d. See *Detach the front panel* on page 92.
2. Loosen the strain relief nut on the work lead.
3. Remove and set aside the screw and washer from J22 on the power board (labeled “WORK LEAD”) that attaches the lead to the board.

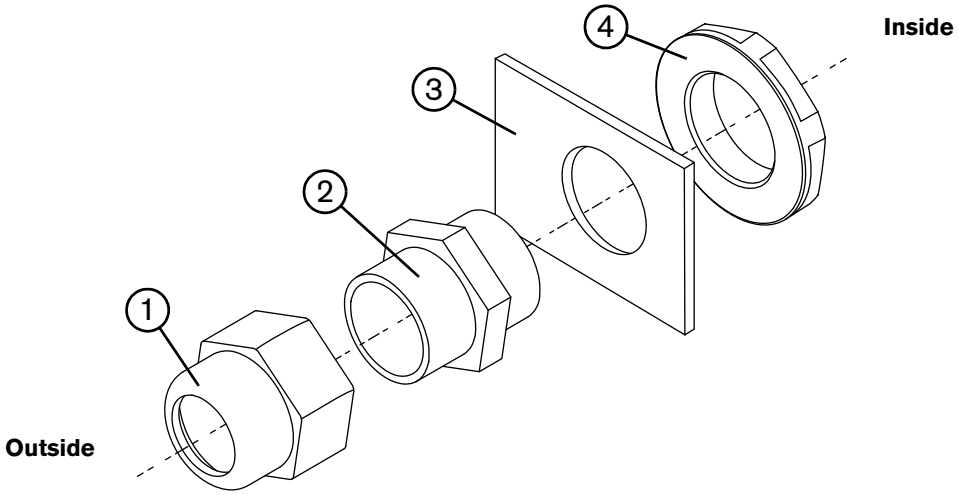
**Figure 98**




**1** Front panel
**2** Strain relief nut
**3** Work lead
**4** Work lead connection to power board (J22)

4. On the inside of the front panel, remove the strain relief's retaining nut.
5. Pull the work lead through the hole in the front panel.
6. Route the connector end of the new work lead through the hole in the front panel and then through the retaining nut.
7. On the inside of the front panel, tighten the retaining nut onto the strain relief.

**Figure 99**




**1** Strain relief nut (outside the power supply)
**2** Strain relief
**3** Front panel
**4** Retaining nut (inside the power supply)

8. Attach the work lead to the power board at J22 using the screw and washer that you removed in step 2. Tighten to 23.0 kg-cm (20 inch-pounds).
9. Complete the following procedures:
   a. See *Reattach the front panel* on page 94.
   b. See *Install the component barrier* on page 91.
   c. See *Install the power supply cover* on page 89.
   d. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

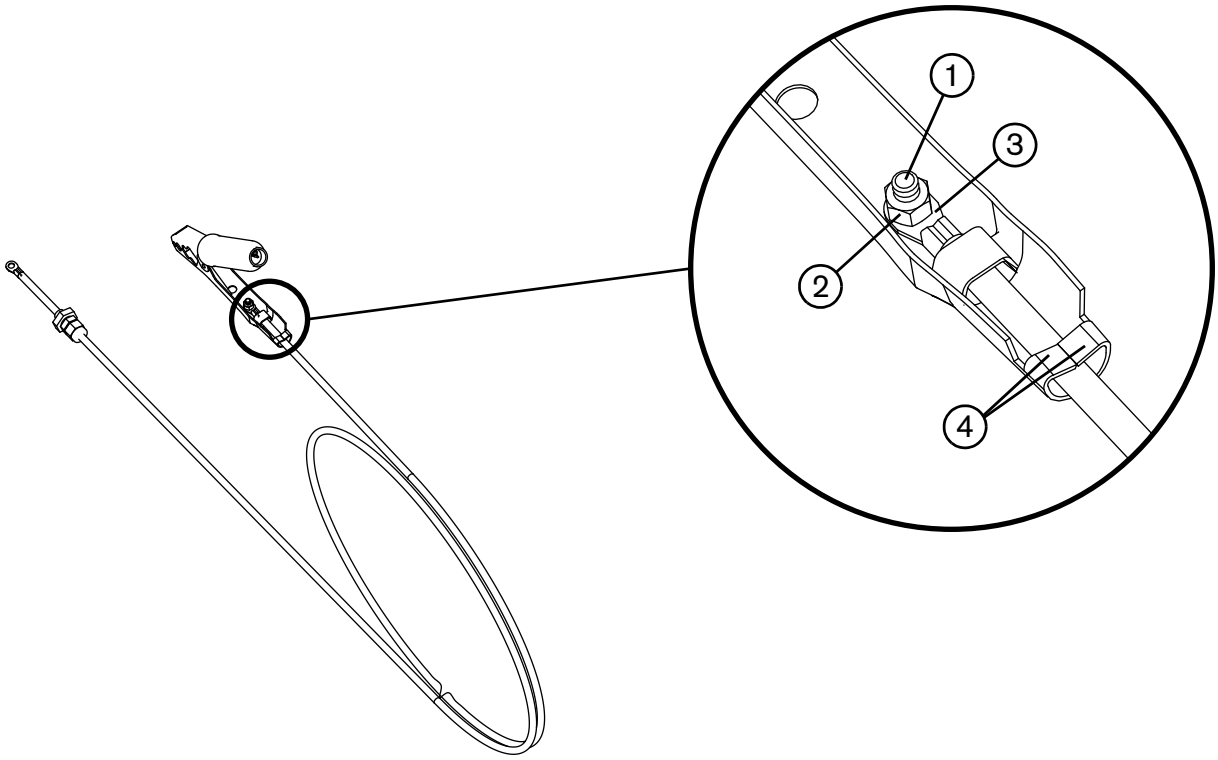
## Remove and install the ground clamp

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Slide down the black plastic sleeve on the handle of the clamp where the work lead is connected.
3. Straighten out the bent tabs that hold the work lead in place. See *Figure 100*.
4. Loosen the screw that connects the work lead to the clamp.
5. Remove the work lead from the clamp, and discard the old clamp.
6. On the replacement clamp, slide down the black plastic sleeve on the handle of the clamp where you want to connect the work lead.

   You can attach the work lead to either of the clamp's handles.

7. Thread the work lead through the plastic sleeve you removed in the previous step and then through the slots inside the handle that act as a strain relief.
8. Line up the hole in the wire terminal with the hole in the handle of the ground clamp.
9. Insert the screw through the handle and the ring terminal on the end of the lead, and fasten it with the kepnut. Tighten the screw to 23.0 kg-cm (20 inch-pounds).
10. Fold the metal tabs over the wire to attach the wire to the handle. See *Figure 100*.
11. Slide the plastic sleeve over the handle of the new ground clamp.

Figure 100




**1** Screw through handle and work lead

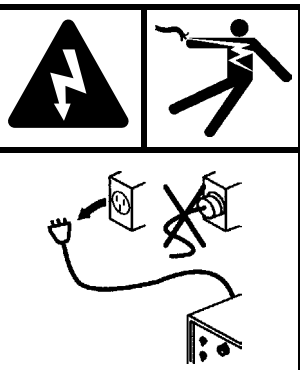
**2** Kepnut

**3** Ring terminal

**4** Strain relief tabs

# Section 7

# Torch Component Replacement



**WARNING!**

**ELECTRIC SHOCK CAN KILL**

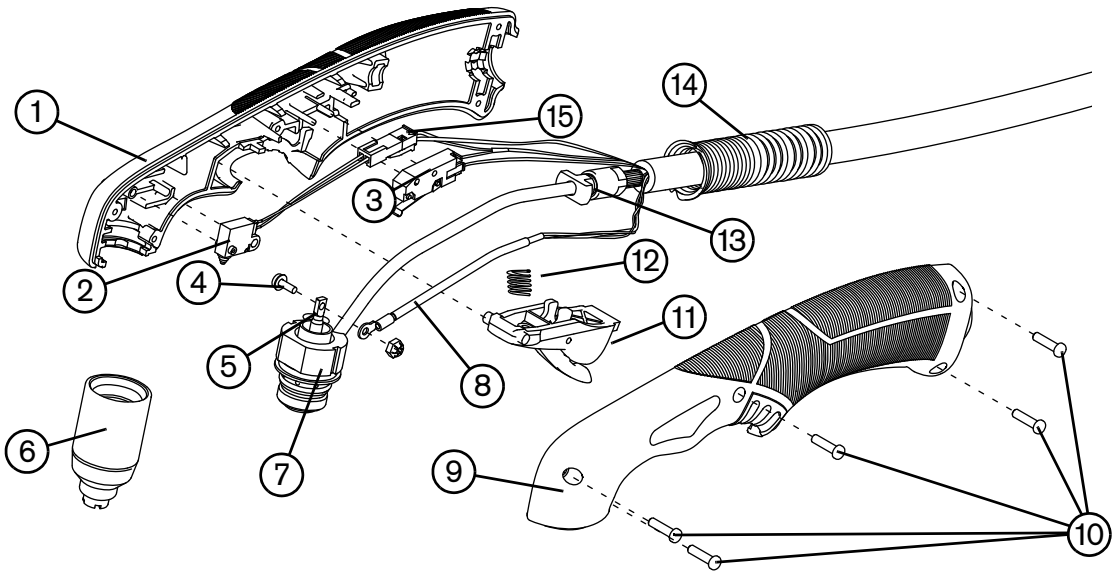
**Disconnect electrical power before performing any maintenance.**

**See the *Safety and Compliance Manual* (80669C) for more safety precautions.**

## Disconnect the power, gas supply, and torch

1. Turn the plasma power supply switch to OFF (**O**).
2. Disconnect the power cord from the power source.
3. Disconnect the gas supply hose from the plasma power supply.

**Figure 101**




**1** Right side of the handle
**2** Cap-sensor switch
**3** Start switch
**4** Plunger screw
**5** Plunger
**6** Consumables
**7** Torch body
**8** Torch power wire
**9** Left side of the handle
**10** Screws (5)
**11** Trigger assembly
**12** Trigger spring
**13** Gas hose fitting's flange
**14** Strain relief
**15** Cap-sensor wire connector

## Replacing the handle

| Kit | Description |
|---|---|
| *428177* | *Kit: Duramax LT torch handle (includes handle screws)* |

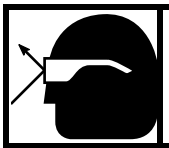
### Remove the handle

Many repairs require the removal of the handle and other components. To remove the old handle and install a new handle, you need to remove all components from the handle. Several other procedures in this section reference this procedure.

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the consumables from the torch.
3. Place the torch on a flat surface with the left side of the handle facing up.

   The left side of the handle is the side with the screws.

4. Remove the screws from the torch handle. Set the screws aside.

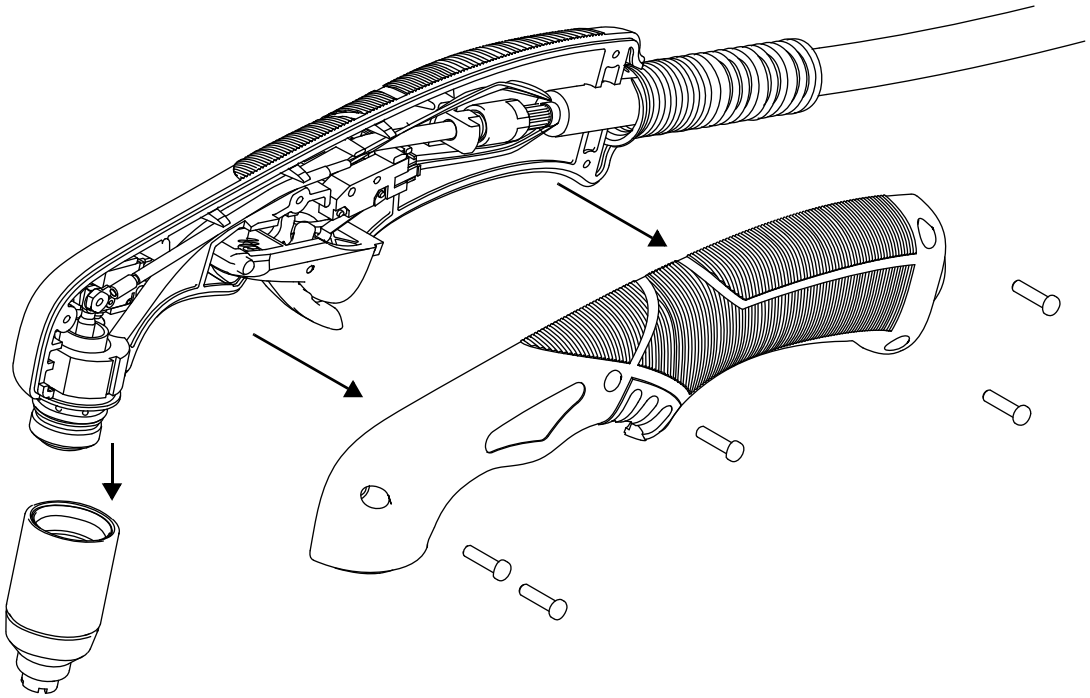


**CAUTION!**

**Wear eye protection, as the trigger spring can launch out of the handle.**

5. Being careful to keep the trigger spring from launching out of the handle, lift the left side of the handle away from the torch.

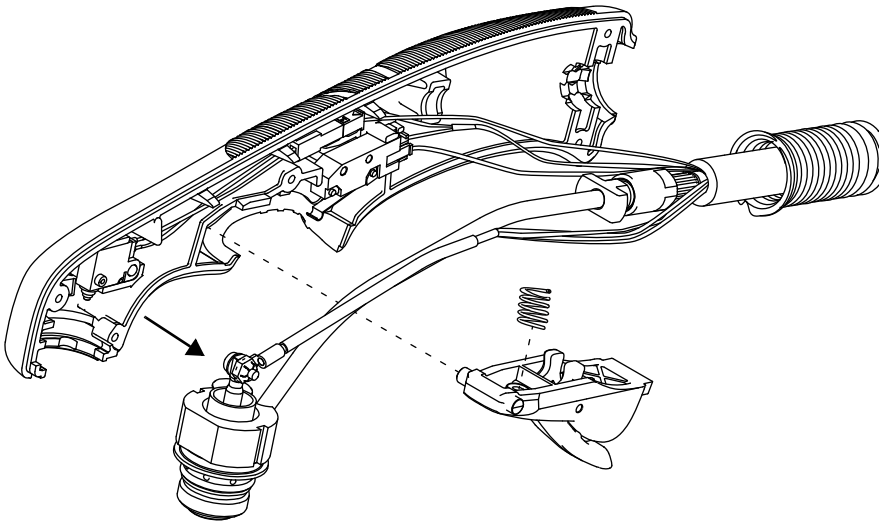
Figure 102



6. While holding the spring in place, slide the trigger and spring up and out of the handle. Set them aside.

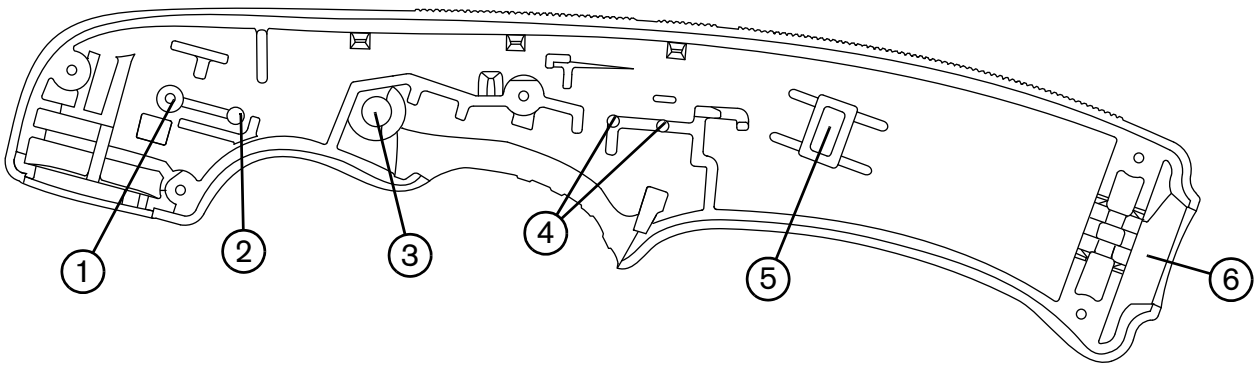
7. The torch body fits snugly into the right side of the handle. While holding the torch body in place, gently press the right side of the handle away from the torch body to remove it.

Figure 103



**8.** Slide the cap-sensor switch off its mounting post. (See *Figure 105*.)

**Figure 104**




**1** Cap-sensor switch's post hole

**2** Cap-sensor switch's mounting post

**3** Trigger's pivot hole

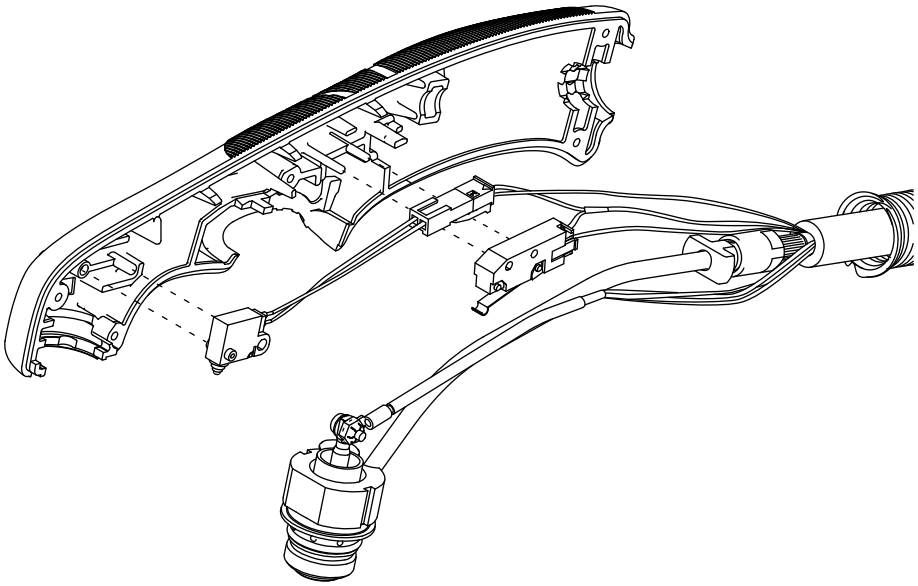
**4** Start switch's mounting posts

**5** Slot for the gas hose fitting's flange

**6** Strain relief slot

**9.** Slide the start switch off the two mounting posts.

**Figure 105**



## Install the handle

1. Lay the right side of the handle on a flat surface with the inside facing up.

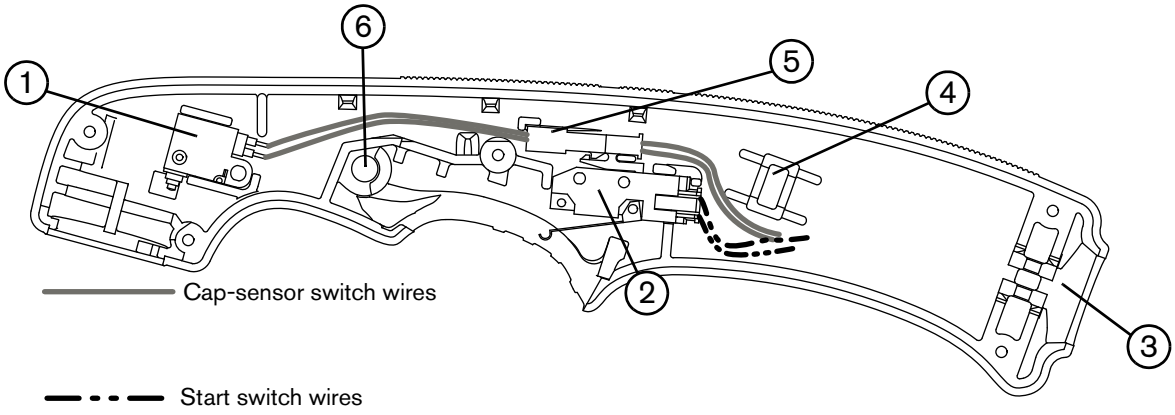
   If replacing the handles, apply the Duramax LT label to the left side of the torch handle.

2. Press the cap-sensor switch into its post hole and onto its mounting post. (See *Figure 105*.)

3. Route the cap-sensor wires as shown in *Figure 106*. Place the connector above the start switch's posts with the wires positioned below the slot for the gas hose fitting's flange as shown.

4. Press the start switch onto the two mounting posts and position the wires below the slot for the gas fitting. The start switch should hold the cap-sensor switch connector in place. (See *Figure 105* and *Figure 106*.)

**Figure 106**

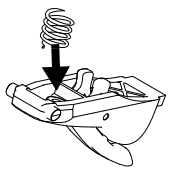



1 Cap-sensor switch
2 Start switch
3 Slot for torch lead strain relief
4 Slot for gas hose fitting's flange
5 Cap-sensor switch connector
6 Trigger's pivot hole

5. Press the torch body into the torch handle with the gas hose fitting's flange aligned with the slot in the handle.

6. Align the strain relief with the strain relief slot in the handle. (See *Figure 106* for the location of the strain relief slot.)

7. Compress the trigger spring into the front half of the trigger. Slide the trigger and spring into place.



8. Being careful that the handle does not pinch the wires, align the left half of the handle with the right half. Verify that the trigger pivots are both located in the trigger pivot holes. (See *Figure 106*.)

9. Install the handle screws.

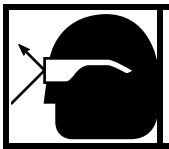
10. Install the consumables.

11. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the trigger assembly

| Kit | Description |
|---|---|
| *428156* | *Kit: Torch trigger and spring* |

1. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
2. Remove the consumables from the torch.
3. Place the torch on a flat surface with the left side of the handle facing up.
4. Remove the screws from the torch handle. Set the screws aside.

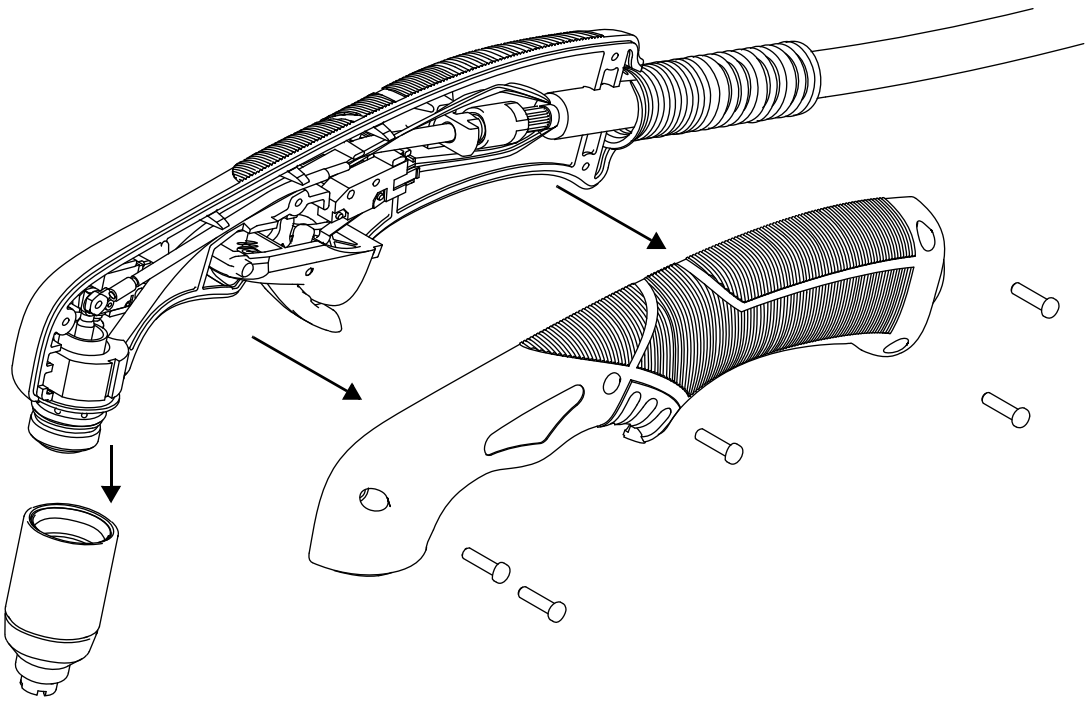


**CAUTION!**

**Wear eye protection, as the trigger spring can launch out of the handle.**

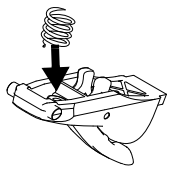
5. Being careful to keep the trigger spring from launching out of the handle, lift the left side of the handle away from the torch.

**Figure 107**



6. While holding the spring in place, slide the trigger and spring up and out of the handle. Set them aside.

7. Compress the trigger spring into the front half of the trigger. Slide the trigger and spring into place.



8. Making sure that the handle does not pinch the wires, align the left half of the handle with the right half. Verify that the trigger pivots are both located in the trigger pivot holes. (See *Figure 106* on page 176.)

9. Install the handle screws.

10. Install the consumables.

11. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

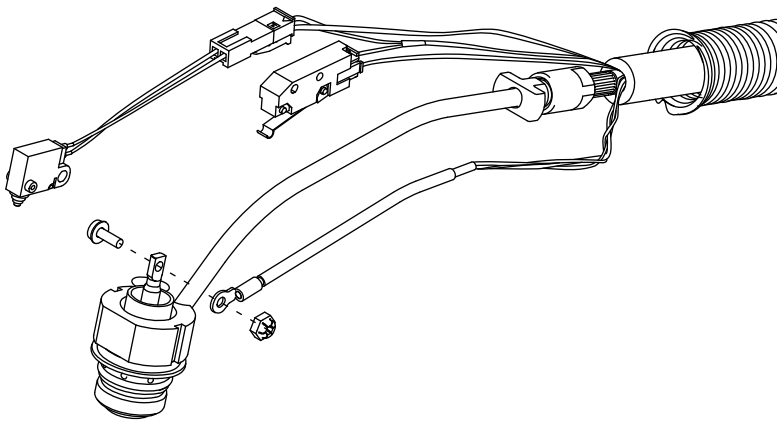
## Replacing the torch body

| Kit | Description |
|---|---|
| *428178* | *Kit: Duramax LT torch body (includes o-ring)* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. Remove all components from the torch. See *Remove the handle* on page 173.

2. Remove the screw that attaches the torch power wire to the torch body. Set the nut and screw aside.

**Figure 108**

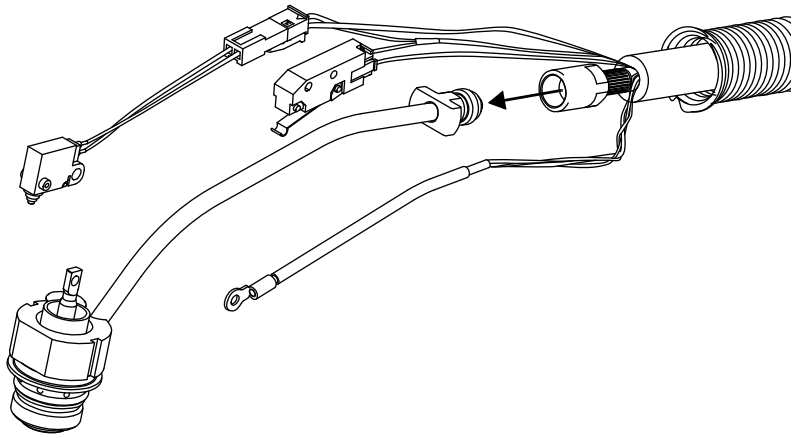


**3.** Use two wrenches to loosen the gas fitting that attaches the torch body to the torch lead.

**CAUTION!**

**Always use two wrenches to properly loosen and tighten the hex nuts and bolts mentioned in these procedures.**

**Figure 109**



**4.** Thread the torch body into the torch lead to finger tight plus 1/4 turn.

**5.** Tighten the screw that attaches the torch power wire to the torch body until the terminal is snug against the plunger. (See *Figure 108* on page 178 for the screw installation order. It is important that the screw be installed as shown.)

**6.** Complete the following procedures:

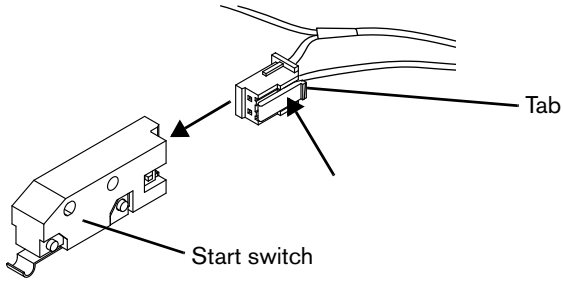
**a.** Install all of the torch components that you removed. See *Install the handle* on page 176.

**b.** Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

## Replacing the start switch

| Kit | Description |
|---|---|
| *428162* | *Kit: Torch start switch* |

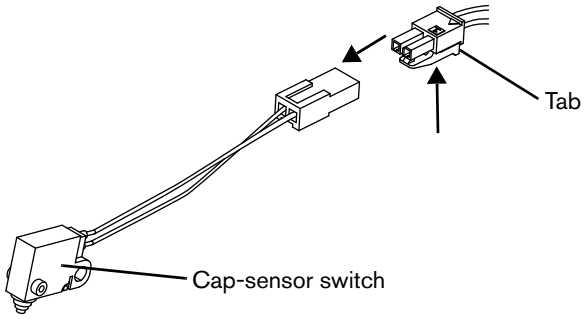
1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. Remove all components from the torch. See *Remove the handle* on page 173.
2. Disconnect the old start switch by pushing on the tab and pulling the start switch away from the connector.
3. Connect the new start switch by pushing the mating plug into the socket.
4. Complete the following procedures:
   a. Install all of the torch components that you removed. See *Install the handle* on page 176.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).



## Replacing the cap-sensor switch

| Kit | Description |
|---|---|
| *228109* | *Kit: Torch cap-sensor switch* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. Remove all components from the torch. See *Remove the handle* on page 173.
2. Disconnect the old cap-sensor switch by pressing the tab on the connector and pulling the connector apart.
3. Connect the new cap-sensor switch to the torch lead by pushing the mating plug on the torch lead wires into the socket.
4. Complete the following procedures:
   a. Install all of the torch components that you removed. See *Install the handle* on page 176.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

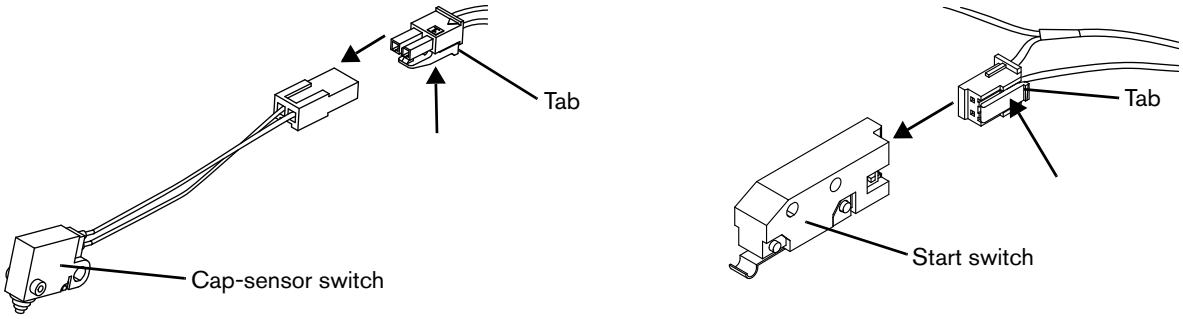


## Replacing the torch lead

| Kit | Description |
|---|---|
| *428176* | *Kit: Duramax LT torch lead, 4.6 m (15 feet), with strain relief* |

1. Complete the following procedures:
   a. Set the power switch to OFF (**O**), disconnect the power cord from the power source, and disconnect the gas supply.
   b. Remove all components from the torch. See *Remove the handle* on page 173.
2. Disconnect the cap-sensor switch and start switch.

**Figure 110**

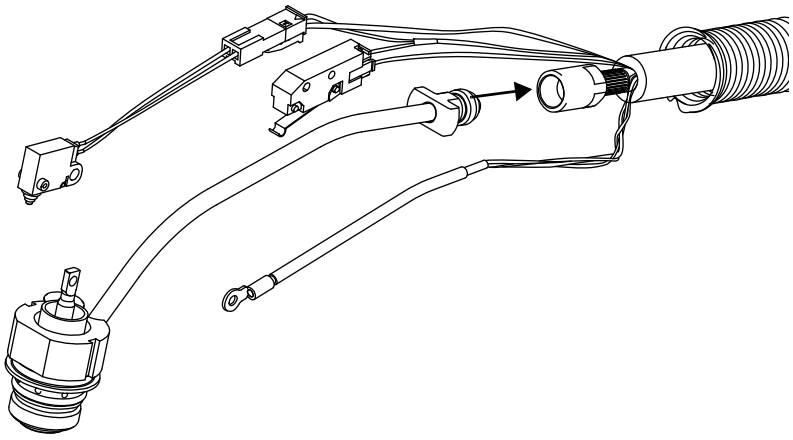



3. Remove the screw that attaches the torch's torch power wire to the torch body. Set the nut and screw aside. (See *Figure 108* on page 178 for the location of the screw.)
4. Use 2 wrenches to loosen the gas fitting that attaches the torch body to the torch lead.

**CAUTION!**

**Always use two wrenches to properly loosen and tighten the hex nuts and bolts mentioned in these procedures.**

**Figure 111**

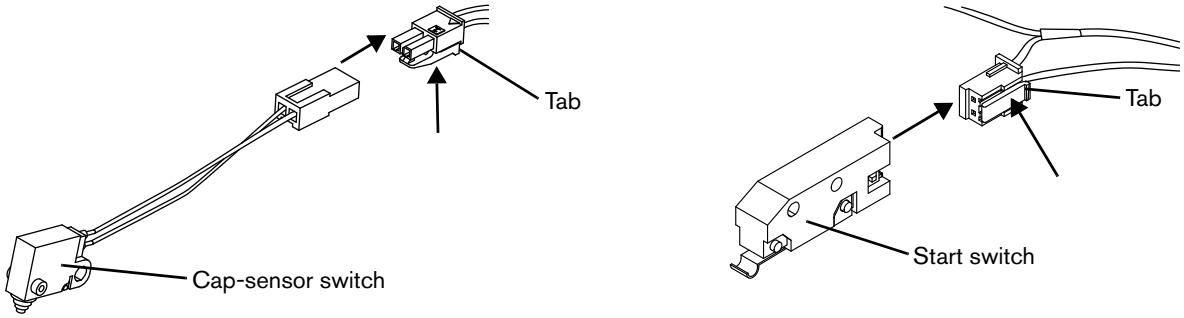


5. Thread the torch body into the new torch lead to finger tight plus 1/4 turn.

6. Tighten the screw that attaches the torch power wire to the torch body until the terminal is snug against the plunger. (See *Figure 108* on page 178 for the screw position.)

7. Connect the cap-sensor switch and start switch.

**Figure 112**




8. Complete the following procedures:
   a. Install all of the torch components that you removed. See *Install the handle* on page 176.
   b. Reconnect the gas supply and power cord, and set the power switch to ON (**I**).

# Section 8

# Parts

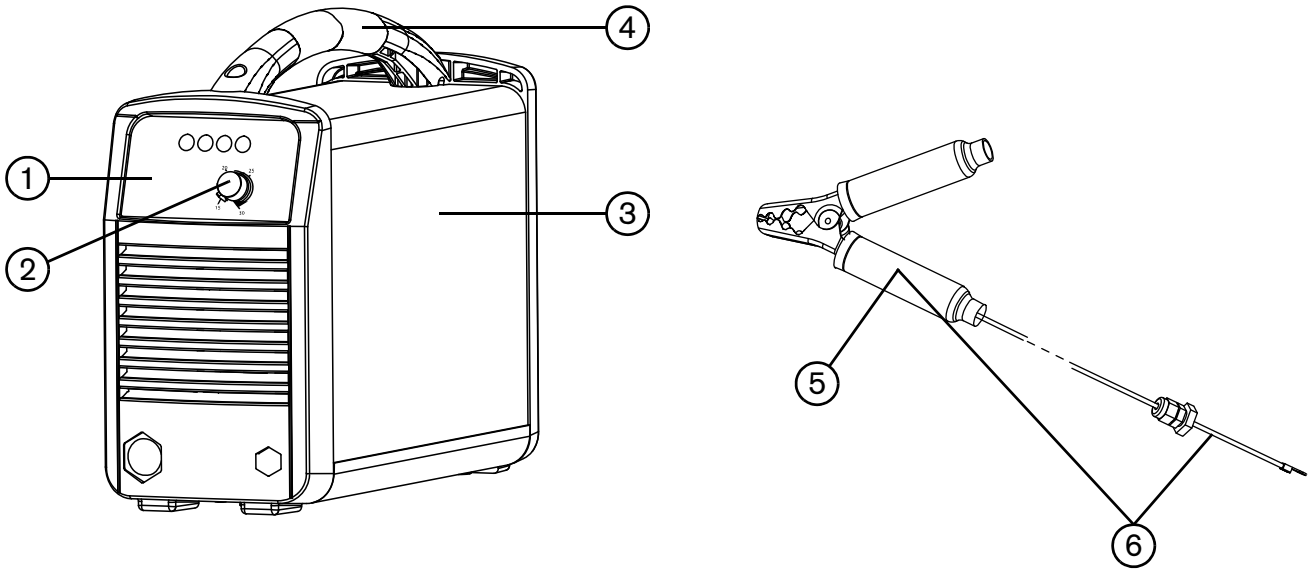
Use the Hypertherm kit numbers in this section to order replacement parts, consumables, and accessories for your Powermax30 XP power supply and Duramax LT hand torch.

You can find procedures explaining how to install these kits in *Power Supply Component Replacement* on page 87 and *Torch Component Replacement* on page 171.

For instructions on installing the consumables in the Duramax LT hand torch, see *Install the consumables* on page 42.

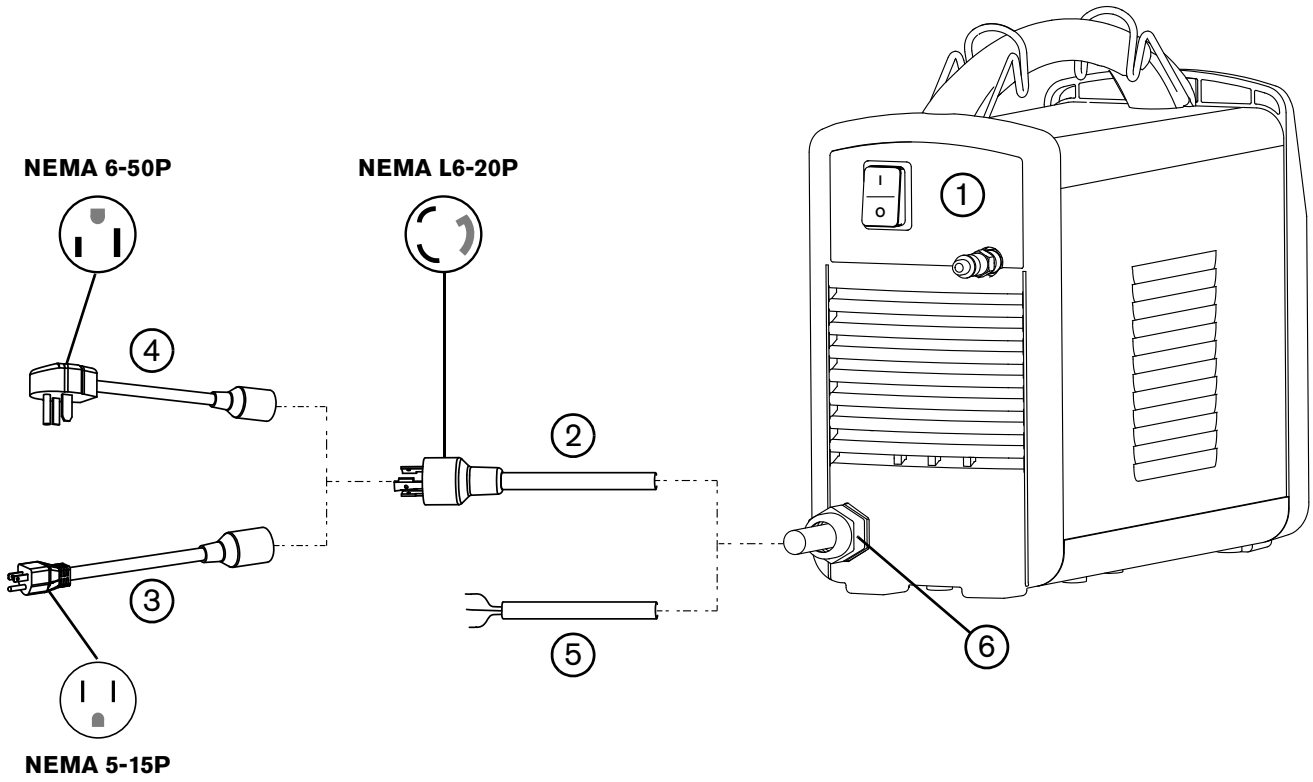
# Power supply parts

## Exterior, front



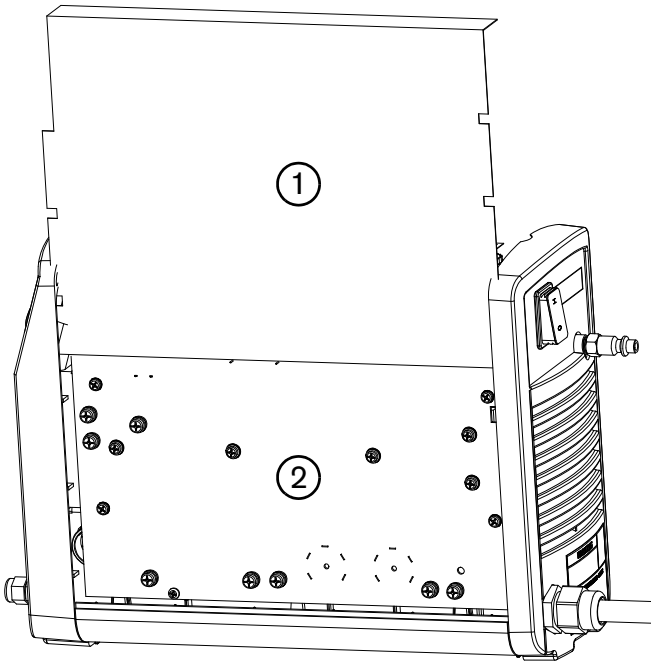

| Item | Kit number | Description |
|---|---|---|
| | 228096 | Kit: Screws for the power supply cover and handle (not shown) |
| **1** | 428219 | Kit: Front panel |
| **2** | 428226 | Kit: Current adjustment knob |
| **3** | 428221 | Kit: Power supply cover with labels, CSA |
| **3** | 428222 | Kit: Power supply cover with labels, CSA, Built in America |
| **3** | 428224 | Kit: Power supply cover with labels, CE |
| **3** | 428225 | Kit: Power supply cover with labels, CCC |
| **4** | 228099 | Kit: Handle with screws |
| **5** | 228561 | Kit: Ground clamp |
| **6** | 428239 | Kit: Work lead, 4.6 m (15 feet), with ground clamp |

## Exterior, rear



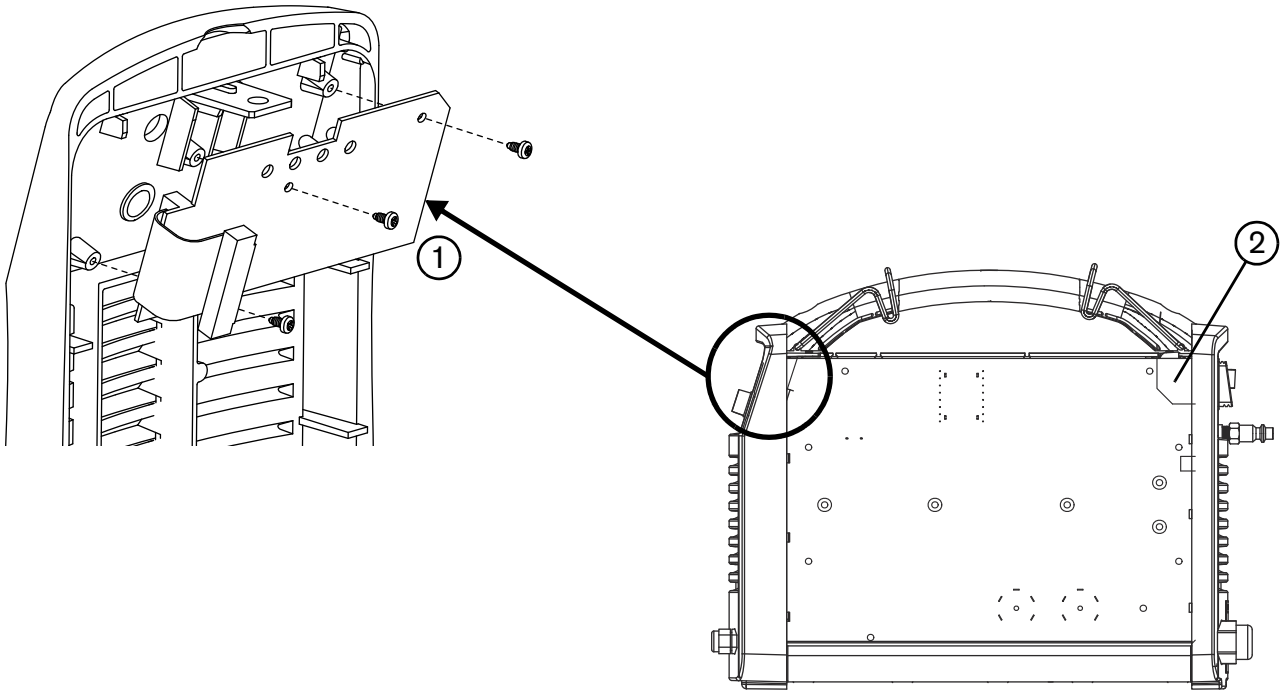

| Item | Kit number | Description |
|---|---|---|
| **1** | 428220 | Kit: Rear panel |
| **2** | 228210 | Kit: CSA power cord with NEMA twist lock-style 240 V / 20 A plug, 1-phase, 3.0 m (10 feet) |
| **3** | 229132 | CSA power cord extension: 120 V / 15 A plug adapter |
| **4** | 229133 | CSA power cord extension: 240 V / 20 A plug adapter |
| **5** | 228140 | Kit: CE power cord, 1-phase, 3.0 m (10 feet) (plug not included) |
| **5** | 428231 | Kit: CCC power cord, 1-phase, 3.0 m (10 feet) (plug not included) |
| **6** | 228143 | Kit: Power cord strain relief |

## Interior, power board side



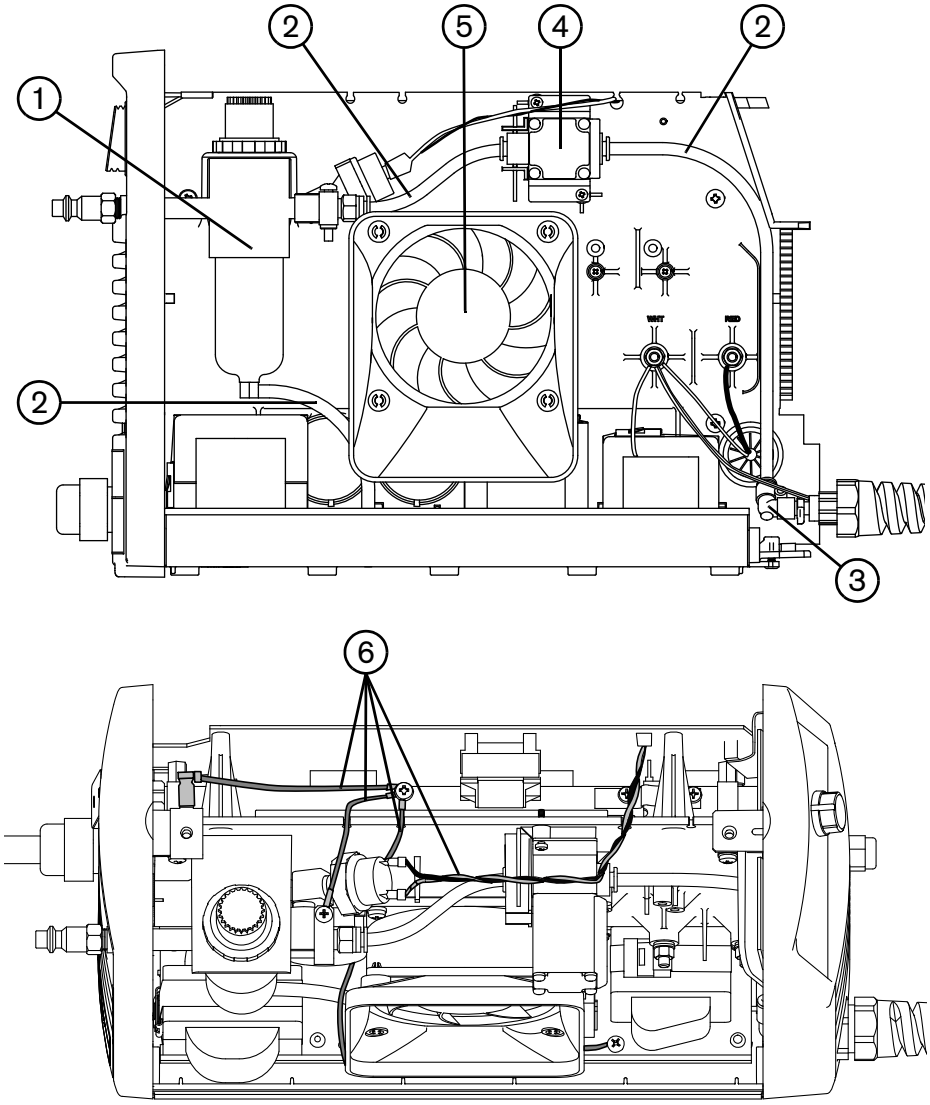

| Item | Kit number | Description | Designator |
|---|---|---|---|
| **1** | 228104 | Kit: Component barrier | |
| **2** | 428233 | Kit: Power board, CSA (141304) | PCB2 |
| **2** | 428234 | Kit: Power board, CE and CCC (141309) | PCB2 |

## Control board and power switch



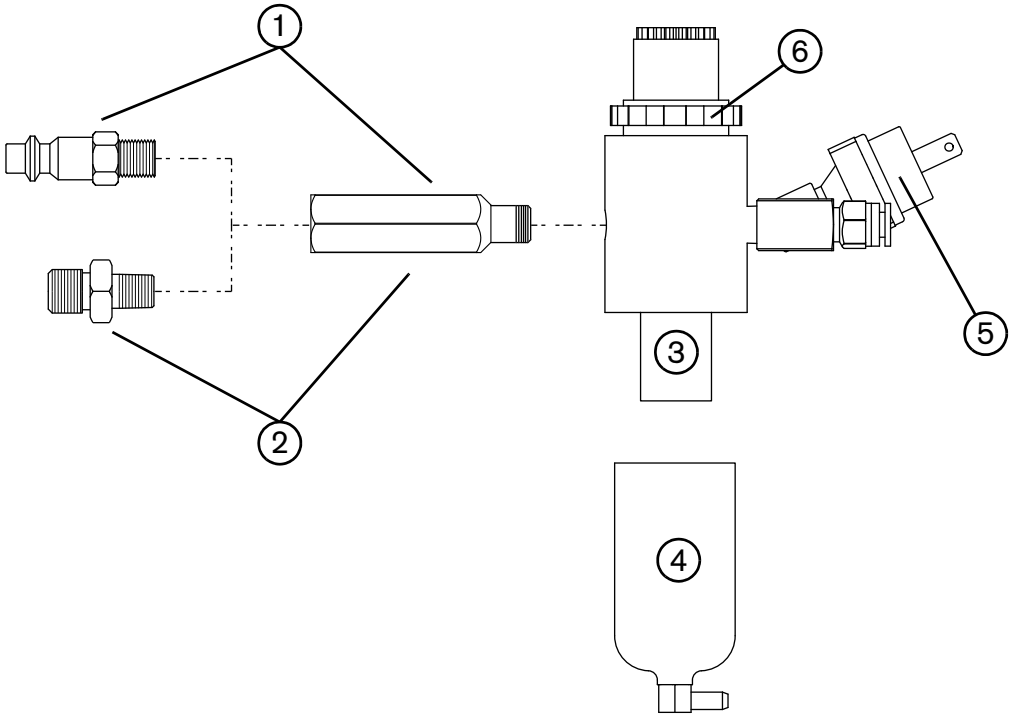

| Item | Kit number | Description | Designator |
|---|---|---|---|
| **1** | 428232 | Kit: Control board (141336) | PCB1 |
| **2** | 428235 | Kit: Power switch | S1 |

## Interior, fan side



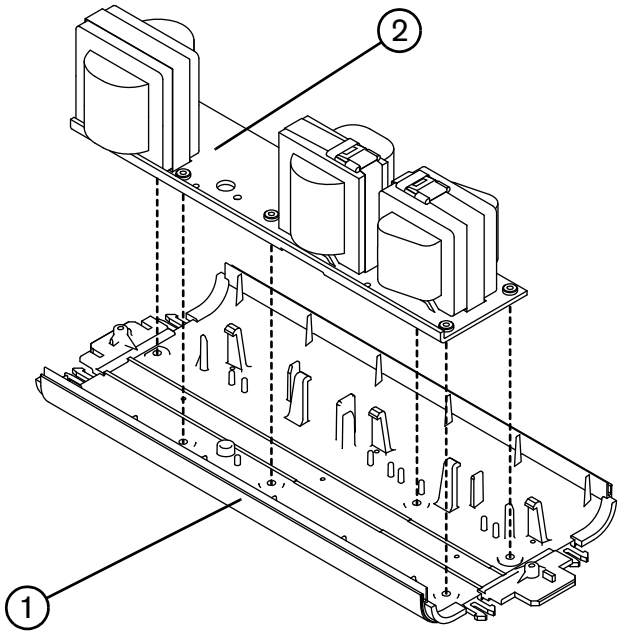

| Item | Kit number | Description | Designator |
|---|---|---|---|
| **1** | 228106 | Kit: Air filter/regulator with pressure switch | |
| **2, 3** | 228095 | Kit: Hoses: drain hose, two gas supply hoses, elbow fitting | |
| **3** | 428238 | Kit: Replacement elbow fittings | |
| **4** | 428173 | Kit: Solenoid valve | V1 |
| **5** | 428236 | Kit: Fan assembly with plenum | M1 |
| **6** | 228103 | Kit: Wire group: pressure switch wire pair, 3 ground wires | |

**Air filter/regulator with pressure switch assembly**



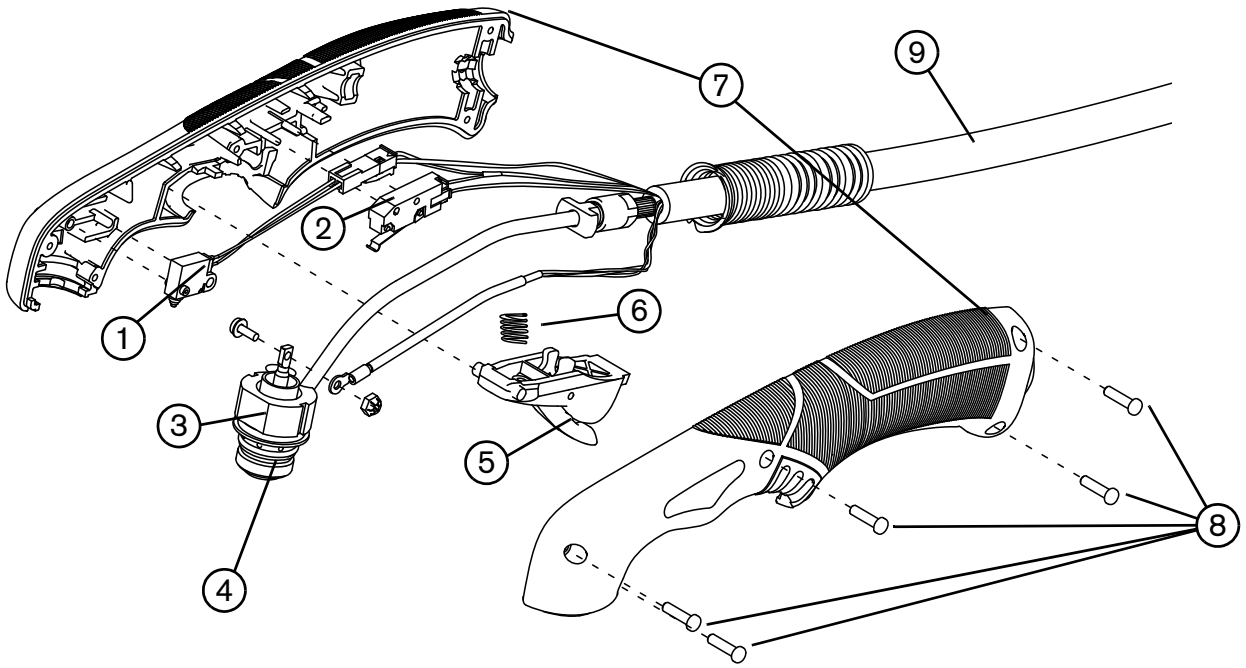

| Item | Kit number | Description |
|---|---|---|
| | 228106 | Kit: Air filter/regulator with pressure switch assembly |
| **1** | 428171 | Kit: Air inlet fittings, CSA |
| **2** | 428172 | Kit: Air inlet fittings, CE/CCC |
| **3** | 428237 | Kit: Air filter element |
| **4** | 428246 | Kit: Air filter bowl |
| **5** | 228688 | Kit: Pressure switch |
| **6** | 428262 | Kit: Air filter retaining nut |

## Power supply base and magnetics




| Item | Kit number | Description |
|---|---|---|
| **1** | 228139 | Kit: Plastic base |
| **2** | 428230 | Kit: Magnetics assembly |

## Duramax LT hand torch parts



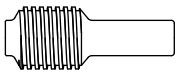
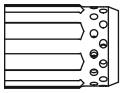
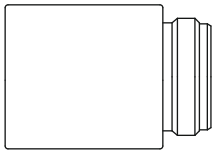
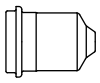
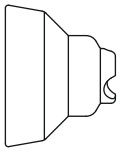
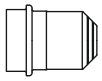
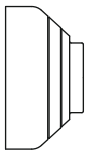

You can replace the entire hand torch and lead assembly, or you can replace individual torch components.

| Item | Kit number | Description |
|---|---|---|
| | 428174* | Kit: Duramax LT hand torch assembly with 4.6 m (15 foot) lead |
| **1** | 228109 | Kit: Torch cap-sensor switch |
| **2** | 428162 | Kit: Torch start switch |
| **3** | 428178 | Kit: Duramax LT torch body (includes o-ring) |
| **4** | 428179 | Kit: Replacement o-rings for torch body |
| **5** | 428156 | Kit: Torch trigger and spring |
| **6** | 428182 | Kit: Replacement springs for torch trigger |
| **7** | 428177 | Kit: Duramax LT torch handle (includes handle screws) |
| **8** | 428181 | Kit: Duramax LT torch replacement handle screws |
| **9** | 428176 | Kit: Duramax LT torch lead, 4.6 m (15 feet), with strain relief |

* The torch assembly includes one set of general-purpose consumables:

- Electrode (420120)
- Swirl ring (420211)
- Retaining cap (420114)
- Nozzle (420118)
- Shield (420116)

## Duramax LT hand torch consumables

| | Part number | Description |
|---|---|---|
| **All applications** | 420120 | Electrode  |
| | 420211 | Swirl ring  |
| | 420114 | Retaining cap  |
| **General-purpose** | 420118 | Nozzle  |
| | 420116 | Shield  |
| **FineCut** | 420117 | Nozzle  |
| | 420115 | Deflector  |

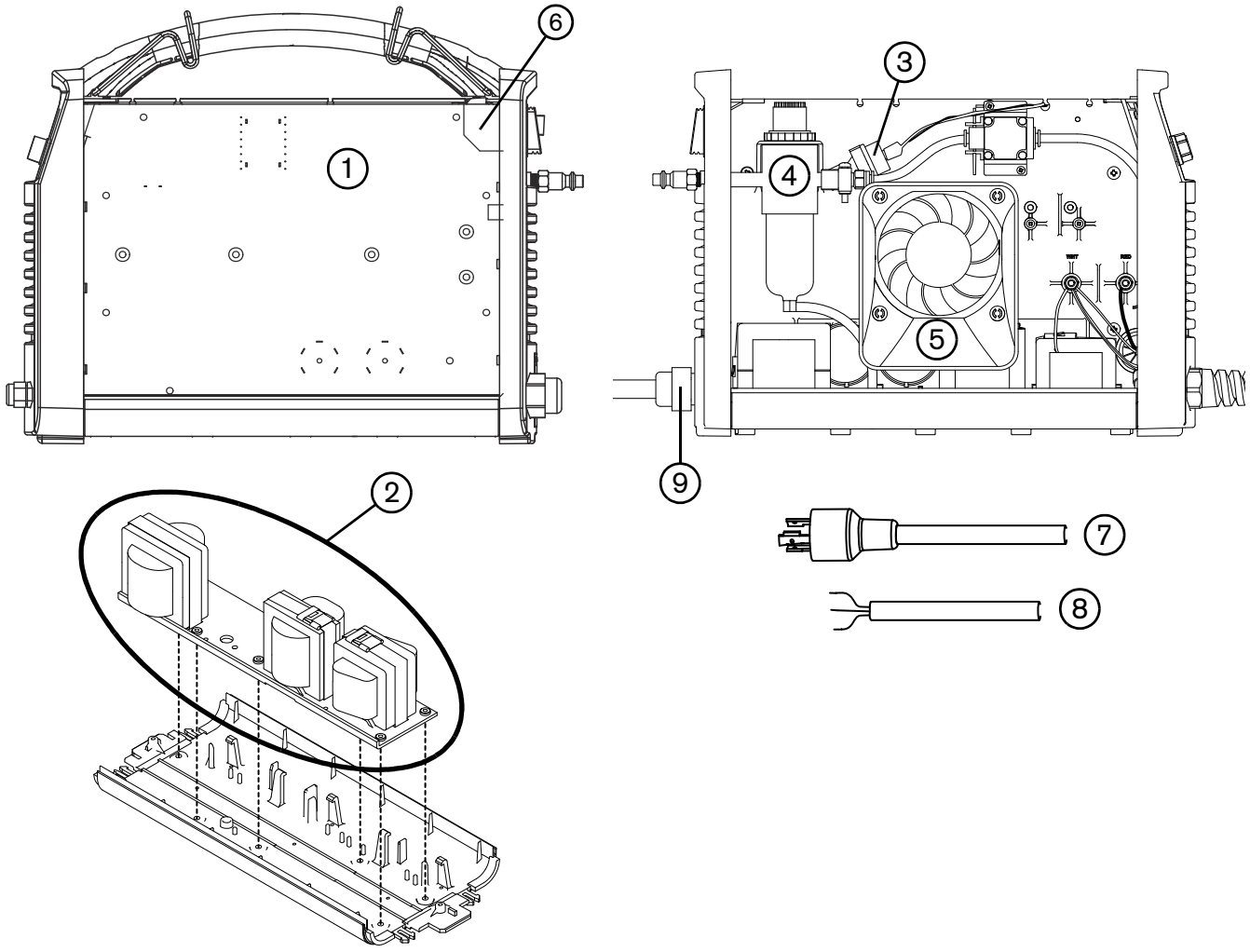
Use the same electrode, swirl ring, and retaining cap for both general-purpose and FineCut applications. Do not use the general-purpose nozzle with the deflector; do not use the FineCut nozzle with the shield.

## Accessory parts

| Part number | Description |
|---|---|
| 127102 | Basic plasma (circle) cutting guide |
| 027668 | Deluxe plasma (circle) cutting guide |
| 127144 | Dust cover |
| 127410 | Carrying case |
| 024548 | Leather torch lead cover, brown, 7.6 m (25 feet) |
| 024877 | Leather torch lead cover, black with Hypertherm logo, 7.6 m (25 feet) |
| 127217 | Shoulder strap |
| 128647 | Kit: Eliminizer air filtration |
| 127169 | Leather cutting gloves |
| 127416 | Protective glasses, shade 6 lens |
| 127103 | Face shield, shade 8 lens |
| 127239 | Face shield, shade 6 lens |
| 127105 | Replacement lens for face shield, shade 8 |
| 127243 | Replacement lens for face shield, shade 6 |
| 128836 | Thermal grease, 1/8 ounce |
| 027055 | Silicone lubricant, 1/4 ounce |

## Safety-critical parts

Genuine Hypertherm parts are factory-recommended parts for your Hypertherm system. Any damage caused by the use of parts that are not from Hypertherm may not be covered by the Hypertherm warranty. In addition, the following parts are safety-critical parts that must be replaced only with genuine Hypertherm parts to maintain the warranty and system certifications, including CE, CSA, and CCC certification.




| Item | Kit number | Description |
|---|---|---|
| **1** | 428233 | Kit: Power board (CSA) and subcomponents |
| **1** | 428234 | Kit: Power board (CE and CCC) and subcomponents |
| **2** | 428230 | Kit: Magnetics assembly |
| **3** | 228688 | Kit: Pressure switch |
| **4** | 228106 | Kit: Air filter/regulator with pressure switch |
| **5** | 428236 | Kit: Fan assembly (includes plenum) |
| **6** | 428235 | Kit: Power switch |

| Item | Kit number | Description |
|---|---|---|
| **7** | 228210 | Kit: CSA power cord with NEMA twist lock-style 240 V/20 A plug, 1-phase, 3.0 m (10 feet) |
| **8** | 228140 | Kit: CE power cord, 1-phase, 3.0 m (10 feet) (plug not included) |
| **8** | 428231 | Kit: CCC power cord, 1-phase, 3.0 m (10 feet) (plug not included) |
| **9** | 228143 | Kit: Power cord strain relief |

## Recommended spare parts

Hypertherm recommends that service centers keep the following spare parts on hand for repairs because these parts are critical or are usually exposed to heavy and repeated wear. You may find that you need to revise or expand this list for your customers, based on the conditions and work environments in your region.

| Kit Number | Description | Reference |
|---|---|---|
| 428226 | Kit: Current adjustment knob | page 186 |
| 228561 | Kit: Ground clamp | page 186 |
| 428239 | Kit: Work lead, 4.6 m (15 feet) (includes ground clamp) | page 186 |
| 428235 | Kit: Power switch | page 188 |
| 428232 | Kit: Control board | page 188 |
| 428233 | Kit: Power board, CSA | page 188 |
| 428234 | Kit: Power board, CE and CCC | page 188 |
| 428173 | Kit: Solenoid valve | page 190 |
| 228688 | Kit: Pressure switch | page 190 |
| 228106 | Kit: Air filter/regulator with pressure switch | page 190 |
| 428237 | Kit: Air filter element | page 190 |
| 428179 | Kit: Replacement o-rings for torch body | page 193 |
| 428177 | Kit: Duramax LT torch handle | page 193 |
| 428181 | Kit: Duramax LT torch handle screws | page 193 |
| 428156 | Kit: Torch trigger and spring | page 193 |
| 428182 | Kit: Spring for torch trigger | page 193 |
| 428162 | Kit: Torch start switch | page 193 |
| 228109 | Kit: Torch cap-sensor switch | page 193 |
| 428174 | Kit: Duramax LT hand torch assembly with 4.6 m (15 foot) lead | page 193 |
| 428176 | Kit: Duramax LT torch lead, 4.6 m (15 feet) | page 193 |
| 128836 | Thermal grease, 1/8 ounce | page 195 |
| 027055 | Silicone lubricant, 1/4 ounce | page 195 |

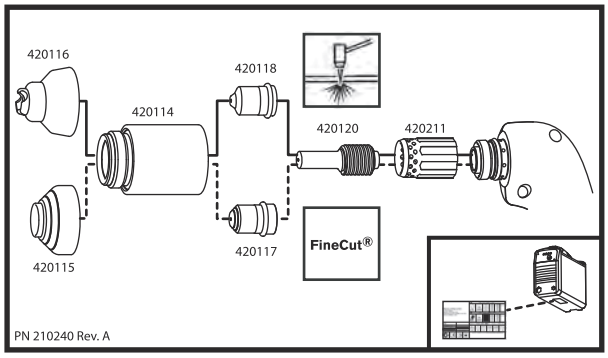
# Powermax30 XP labels

| Kit number | Description |
|---|---|
| 428215 | Kit: Powermax30 XP labels, CSA |
| 428216 | Kit: Powermax30 XP labels, CSA, Built in America |
| 428217 | Kit: Powermax30 XP labels, CE |
| 428218 | Kit: Powermax30 XP labels, CCC |

The label kits include:

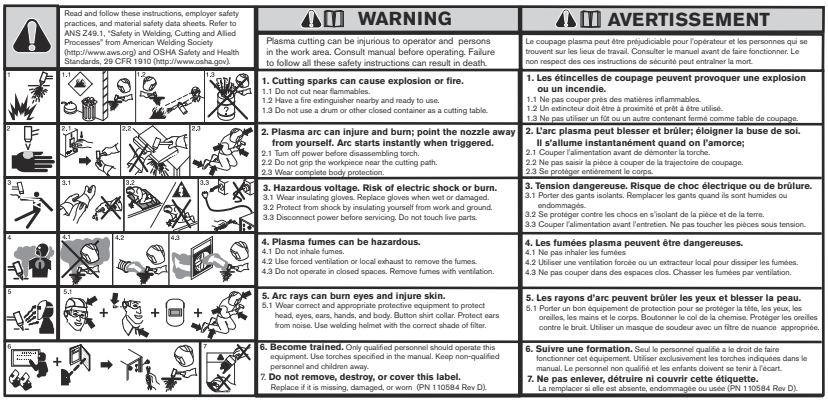
- Consumables label
- Appropriate safety labels
- Front and side decals

The following illustrations show the consumables label and safety labels.




Consumables label

CE/CCC safety label


WARNING
AVERTISSEMENT
1. Cutting sparks can cause explosion or fire.
2. Plasma arc can injure and burn; point the nozzle away from yourself. Arc starts instantly when triggered.
3. Hazardous voltage. Risk of electric shock or burn.
4. Plasma fumes can be hazardous.
5. Arc rays can burn eyes and injure skin.
6. Become trained.
7. Do not remove, destroy, or cover this label.

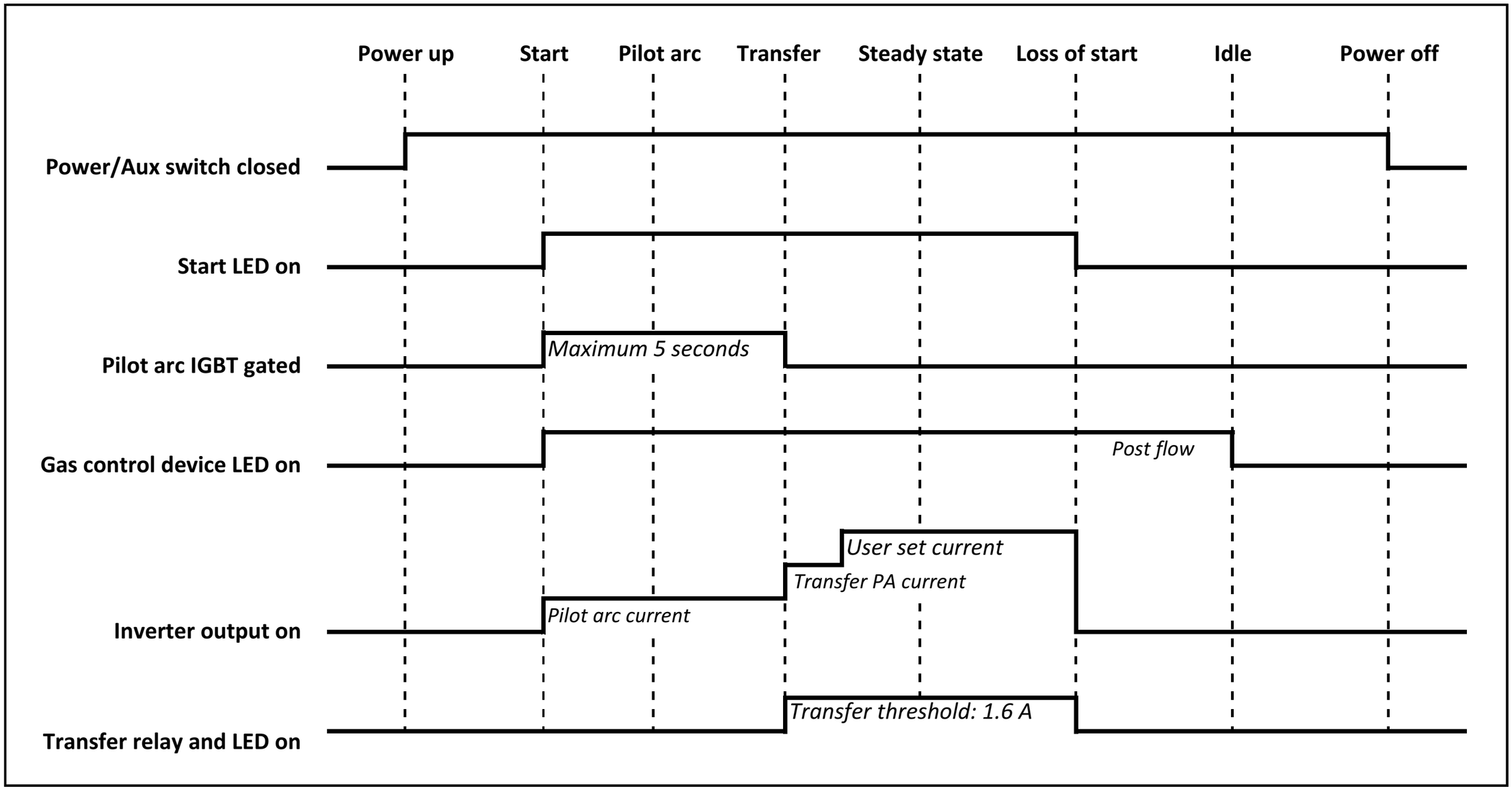
CSA safety label

# Wiring Diagrams

This section contains the following diagrams:

- *Powermax generic timing chart*
- *Powermax30 XP schematic*

## Powermax generic timing chart



## Powermax30 XP schematic